** FRIDEN **

CALCULATING MACHINE -----

SERVICE TECHNICIAN'S HANDBOOK

MANUAL OF SERVICE ADJUSTMENTS

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FRIDEN CALCULATING MACHINE COMPANY, INC.

SERVICE TRAINING CENTER

CLEVELAND, OHIO

FOREWORD

You are about to start on an intensive course of training leading to your becoming a Certified Friden Service Technician. Your success, the success of your employer and the acceptance and use of Friden Calculating Machines in your territory depend to a very large degree upon the quality of technical service you render. However, in addition to rendering technical service, your responsibility to your employer and the Friden Calculating Machine, Co., Inc., entails far more than your ability to maintain Friden Calculators in peak operating condition.

Your personal success as a Friden Service Technician will depend on your ability to install confidence by your appearance, conduct, consideration and loyalty to your Company, as well as by your technical skill and ability to diagnose and permanently repair Friden Calculators in need of technical attention.

Friden Calculating Machines are highly specialized mechanisms. They are well designed and accurately manufactured. When properly adjusted and periodically inspected, they will give years of trouble-free service. If you diligently apply yourself you should have no trouble in learning the principles of operation, adjustment care and maintenance of Friden Calculators.

In your course of training do not hesitate to ask questions at any time. Do not proceed to the next phase of your work until you are absolutely sure that you have mastered the phase on which you are presently working. No one will censure you for asking questions. In fact, your instructors will expect and welcome them.

The following pages are filled with good advice. They are frank and straight-forward. If you follow the advice and principles they advocate, you will find happiness in your hew found work and be proud of yourself and your profession.

This schedule is based on a fourteen week period of attendance and is a rather tight schedule; therefore there cannot be much lost time throughout the course.

You are a class of ONE, interested only in your OWN progress. You are graded on your ability to follow instructions, your initiative, discipline and mental ability for mechanical reasoning. The first few weeks are probationary period during which time your fitness for the work will be passed on by the Service Training Center Instructor.

The Service Manuals are for your use and may be taken out for study. Please do not mark in them or misuse them, for others must refer to these manuals, too. This manual is yours for the purpose of learning everything between the covers, for making notes, for describing mechanical theory and operation.

Feel free to ask questions at any time. If it is necessary to ask the same question several times, DO SO. We want you to understand the problem in question. At any time during an explanation by the instructors you do not quite understand, do not say you do when asked. Let the instructor know so he may straighten you out.

We suggest you take notes and more notes. We suggest you make note of any part of the course that is difficult for you, so you may review it. A part of the course that is difficult to grasp at first is easily skipped by.

We trust you recognize the fact that to accomplish what is outlined and to have a good working knowledge of the machine when you leave, that it will be necessary for you to study in your own time. Your home work assignment is the material you have covered during the day. Examinations are given periodically and to obtain perfect results you must study.

You will not become an experienced Service Technicial in this short time; however, it is our endeavor to instill in you a good working knowledge of the mechanical operation of the Friden Calculator; to try and show you a way to reason mechanically so you may attack a problem quickly and properly.

To properly service a Friden Calculator you have to know it. Knowing the adjustments is not enough, but is mandatory. Knowing the operation and function of the parts so they may be "tied in" for a particular operation and other eliminated is the only way you can properly diagnose service problems.

You are learning to develop a new way of thinking. A way of thinking along the lines of levers, gears, rotary and stationary parts, timing and adjustments. To develop this, be sure you digest all material that is outlined for you.

Through constant repetitious study, the material outlined for you will become instilled in your mind.

USE YOUR HEAD: THINK: REASON: BE CURIOUS: TAKE NOTHING FOR GRANTED.

1. PERSONAL APPEARANCE: In any line of work, especially where you are a representative meeting the public, your personal appearance creates the first and generally most lasting impression.

Be well groomed at all times. Special attention to small details of personal appearance is important. Good taste in clothing can make a tremendous improvement in your personal appearance. Your clothing need not be overly expensive. Strive for the best you can afford for quality clothing will look better and last longer. Make sure your linen is fresh and your suit clean and well pressed.

Just as important as your clothing is your personal grooming. Make sure your hair is cut regularly and that you never appear in your territory heeding a shave. Take good care of your teeth. Keep your hands clean and your fingernails clean and well trimmed. Since your work requires that your hands will often come in contact with oily parts, make sure you always have a small amount of mechanic's soap in your kit. Do not hesitate to ask where you may wash your hands, for there are always adequate facilities adjacent to where the machine you are servicing is situated. Plan to leave each call as well groomed as when you started making your calls at the beginning of the day.

In certain localities the temperature often becomes high and in the course of your work you may become overheated and perspire. As you know, millions of dollars a year are spent by body deodorant manufacturers in advertising. There is a good reason for this advertising. so take its advice to heart and use such a deodorant. The same goes for unpleasant breath. Resist the urge for food too highly seasoned until the evening meal. Remember, you will be in close contact with many people every day, so always be sure that there is no chance of your offending anyone.

You will be more welcome if your personal appearance and grooming leave little to be desired and you will feel more confident and proud of yourself if you feel you always have "your best foot forward". If you make a good impression on your first visit to a customer you have paved the way for good customer relations that in time will mean added business and good will.

2. COURTESY: Nothing more speedily wins respect or creates friendly confidence than courtesy and we are judged by most everyone we contact by our conduct. Remember, the customer is paying your salary.

There are certain rules of conduct, especially in the case of one's attitude toward elderly people and between men and women, that are universal throughout the world. Unfortunately, many of these rules have been allowed to fall out of use. However, people still admire a gentleman and compliment his manners and general deportment by calling him just that, "a gentleman." If your are a gentleman at all times, you will stand out among men and will win more friends for yourself as well as for the Company you represent.

3. PROMPTNESS: People in general dislike waiting, especially if they have a piece of equipment whose service they are denied due to its being in need of adjustment. "Rapid Service"--"Fast Service"--"Try Our One Day Service"--are slogans that companies who perform service are proud of and try their best to live up to. Most of this service is based on prompt action. Therefore, promptness is an attribute most appreciated by those in need of service. Make it a rule to take care of requests for service at the earliest possible moment, evem though it means an extra effort on your part. Never make promises you cannot fulfill. It is bad enough to have a machine in need of adjustment without having the service technician promise to repair it immediately and then appear one day later to do the job. Remember, the patience of the user with an ailing machine becomes shorter every hour until after a very short time it is gone altogether. By doing your best to answer requests for service with the absolute minimum of delay, you will soon promote a reputation for promptness and service for both yourself and your company.

4. TAKING A SERVICE REQUEST: Most requests for service will be made from users over the telephone. Therefore, it is vital to obtain all the information necessary to permit the service technician to reach the user's office and then to locate the ailing machine with a minimum of delay and confusion. For example: The U. S. Steel Company, which has forty-eight departments and three plants all working from a central telephone exchange, makes a service request by telephone. Usually the head of a department in which the ailing machine is located will pick up the telephone and tell the switchboard operator to call the Friden Calculating Machine Company and request that a service technician br sent to repair his ailing machine. Unless the person in the Friden Calculating Machine Company office taking the call obtains detailed information as to the location of the machine, the service technician may be required to spend from fifteen minutes to an hour, after he has arrived at the plant, in locating the machine.

In the above mentioned case, the person taking the request for service should obtain, in addition to the name of the client, the name and number of the department in which the machine is located and the name of the person in charge. This will save delay and embarrassment when the service technician arrives at the plant. It creates a bad impression to have a service technician going from department to department trying to locate an ailing Friden Calculator. As well as disturbing the office personnel, he is at the same time publicly informing everyone in the plant that a Friden Calculator is in need of service attention.

We strongly recommend the use of a service request form for incoming telephone service requests, set up as follows:

Date
Time Received
Name of Firm
Address
Room or Department
Name of person initiating service request
Nature of trouble, if possible
Request taken by
Time Reported.

5. ENTERING AN OFFICE: When you enter the lobby of an office and address the receptionist you should have you "Request for Service" form in hand. In that way, you may give the receptionist the name of the person initiating the request for service and the room or department in which the ailing machine is located. She will either call the person initiating the request and inform him that you are in the lobby, or she may direct you to the room or department in which the ailing machine is located.

Upon intering the office proper present yourself to the person in authority before speaking to anyone else. If you have not previously met this person, you schould introduce yourself by your card and stating simply and directly that you are the Friden service technician who has come at their request to adjust their Friden Calculator. It is advisable to ascertain the person's name before entering the office, either from the "Request for Service" form which you carry or from the receptionist. In this way you may address the person directly by name, which always creates the best impression. In presenting your card, on which is printed your name, telephone number and address, you will make it possible for him to call upon you for future service or for other information which he may require. It also puts you, as a person, and your company on permanent record in his personal file. After you make yourself and business known, the person addressed will direct you to the operator of the ailing machine.

If you operate in the manner outlined above, you will never bypass an office manager. Sometimes office managers take their authority quite seriously and deeply resent outsiders engaging the personnel in conversation without first addressing the office manager. If you create a good impression on the office manager, there is probably no one single person who is in a better position to help you in your servicing of Friden Calaulators or to promote the sales of new calculators among you users.

6. WORKING IN AN OFFICE: After the formalities of entering an office are completed go directly to the ailing machine. Ask the operator to explain the nature of the trouble. She can be of great help to you in your diagnosis of the trouble by explaining the symptoms as she finds them. Once you have obtained this information remove the machine to an idle desk, or better yet to a storeroom or some little used are where you will create a minimum of confusion in the office and be away from inquiring office personnel.

If it is impossible for you to remove the machine and you must work on it in the office, be sure that you take every precaution to see that you do not scratch or mar the office furniture or other equipment. This does not mean that you merely have to be careful. You should prepare a work space for yourself by laying down a heavy cloth or newspaper large enough so that your tools and parts may be laid out neatly near the machine without having them touch the surface of the desk. Do your work as quickly and as quietly as possible in order that you do not disturb the workers in the office or call attention to the fact that you are repairing a Friden Calculator. When you have finished working on the machine, make sure that it is clean and in perfect working order. With this point in mind, it always pays to keep a supply of clean cloths and cleaning solvent in your kit so that you may always leave your job knowing that you left the machine and the operator's work area in as neat and as clean a condition as you found it.

Give the machine a series of performance checks to make sure that you haven't disturbed andy adjustments. Have the operator work a few problems while you observe the operation of the machine so that she has a feeling of confidence that you have properly adjusted the machine.

Often, while watching the operator, you may find she is not using the automatic features to their fullest possible advantage. It takes only a minute or two to suggest to the operator that if she take advantage of the machine's automatic features the machine will do more work with less effort on her part.

If you feel the operator is in need of further instruction or could use certain Friden methods to advantage, suggest that the Friden Sales Representative, who is an expert on operation, will be happy to provide such service at no charge. It is to your advantage that you immediately report this finding to your manager.

When you have finished your work in an office, before taking your leave always thank those persons you contacted, especially the office manager, for their courtesy. Leave them with the impression that, if at any time you can serve them, they should not hesitate to call upon you, and that you will be happy to do everything in your power to speedily take care of their requirements. Make them feel that you are personally interested in their welfare; that your sole object is in seeing that they are satisfied Friden Calculator users. Always make it a point to thank the receptionist when leaving, as she is in a position to be of help to you at the start of every call you make. She will make it possible for you to call you office occasionally during the day to see if any especially important requests have come in during your absence which might be close to your present location, and, therefore, more quickly handled. This will permit you to spend the major portion of your time in working on ailing machines rather than in traveling back and forth across your territory.

7. OFFICE CONDUCT: A very good policy to adopt in regard to your conduct while in a user's office is to promise yourself that you will never engage office personnel in needless conversation. Remember, they are busy and their employer will resent any needless interruptions or time you may cause them to waste. Always address persons by their proper names, such as Mr. Jones, Mrs. Thompson or Miss Green. Never under any circumstances should you call them by their first names or make any personal remarks. If you have friends or acquaintances in the offices you visit, do not carry on personal conversations or business relations with them. This can be done outside their place of employment. A good rule to make is to always be dignified, courteous and considerate, and you will be respected and welcomed whenever your services are required.

8. ALERTNESS: The sales representative covering your territory very often is unable to get beyond the office manager or purchasing agent while making his call. For this reason he may not be aware of the fact that competitive machines are on trial or are being used in certain departments. Often, too, you will be able to obtain trials for the representatives covering the territory or make friends who will be able to give you information you may pass along in order that sales of your Friden Calculators may be made at some time in the future.

Cooperate with the sales representative to the maximum. You are invaluable to him as a service technician and he is invaluable to you for he sells the machines which you must maintain. He can often pick up or deliver machines for you, and he can solicit and promote the sale of service and maintenance contracts for you. You, in turn, can keep your eyes and ears open for possibilities leading to trials and sales of Friden Calculators in his territory. Cooperate--it pays!

9. ENTHUSIASM: Always be enthusiastic about the advantages of Friden Calculating Machines. It is contageous and your enthusiasm will create enthusiasm for Friden Calculating Machines in the minds of others. Calculating machines are wonderful labor saving devices. Not only do they increase the speed of figure production, but they also safeguard accuracy and reduce operator fatigue and effort. If you are enthusiastic about the things the Friden Calculator will do for the user and enthusiastic about your job and what you are doing for the user, you will have all your Friden Calculator users pulling for you 100%.

10. SERVICE KIT: Everyone admires a well kept home or garden or a clean and efficient factory. Your users admire a service technician who has a clean and well organized service kit. Always have enough tools in your kit to do your work. Be sure they are in tiptop condition. Do not carry unnecessary parts and tools. A heavy tool kit has the habit of gaining in weight as the weeks go by and, consequently, heavier at the end of each day.

11. SERVICE REPORTS: The company provides a "Standard Service Report" form, number 48. It is designed to take care of a number of very important functions. Always make out the service report form on every service call at the time the call is made rather than at the end of the day when you are likely to have forgotten much of the pertinent information that should go on this form. It should be made out whether the call is for inspection or repairs and whether the machine is in or out of guarantee. Be sure to fill in all the necessary information, such as machine model and number, customer's name and address, section affected, cause of trouble and how correction was made, list of parts used and the amount to be charged. See that the form is properly dated. Have the customer sign it and then sign it yourself. If the charges are out of the ordinary, it will often pay to review with the office manager what you have done so that he will be able to justify the amount involved. It will also help to keep from creating the impression that a Friden Calculating Machine is an expensive piece of equipment to keep in service.

Aservice report, to be useful, must be properly filled in and should be in legible handwriting in order that the office may invoice the customer without having to contact the service man for information regarding the service call.

12. CARE OF YOUR SERVICE DEPARTMENT: You will, naturally, do a considerable amount of service work in your own service department. This department should be clean and neat and as efficiently laid out as possible. Friden Calculators are a complicated mechanism and deserve the best maintenance possible in order that they may give the years of trouble free service that is built into them. You will be able to give them that service if you Service Department is clean and neat, uncluttered by unnecessary tools, old parts, rags boxes, etc. Do not allow your Service Department to be a place of accumulation for obsolete and broken parts and assemblies. If a part or assembly has outlived its usefulness and has become partly worn out or broken, throw it away. Keep your work area and benches clean for current work. If you are waiting for parts to arrive from the factory for a machine that is partially torn down, store the machine in a suitable cabinet or on a shelf where it may be covered and protected from dust and dirt. Arrange your department so that there is a place for everything. This will speed up your service work immeasurably and make work as a whole more pleasant.

13. CARE OF PARTS: It is necessary that every service department, in order to function smoothly, should have an available supply of spare parts. These parts are worth money and often may not be replaced for a considerable length of time. Therefore, it behooves our service technician to keep those parts in order and in suitable cabinets so they may be located and used with a minimum of delay. Parts should be kept in covered containers to protect them from dust, dirt and corrosion.

Be sure and keep your parts inventory up-to-date. A single nut, bolt, screw or stud can often hold up the return of a user's calculator for days. Do not wait until you run out of parts to re-order a supply. Keep a sufficient inventory of parts on hand at all times. When first going over a machine be sure to replace any part that shows signs of wear or will shortly be in need of replacement, for this part will undoubtedly give you trouble in a short time and leave the impression with the user that you did not properly service his machine on the last call. Remember, a few parts are cheaper than repeat service calls.

14. LOYALTY: You are working for a splendid international corporation when you work for the Friden Calculating Machine Co., Inc. It is a young, virile, imaginative, progressive organization which is destined to maintain a position of

leadership in its chosen field for many, many years to come. You have a right to be proud when you work for such a company. Be loyal to that company and always do your best to uphold the Friden name. The office machine industry is a highly competitive business and its representatives are often high spirited and aggressive. If you are always loyal to the Friden Company, to its products and principles of operation, you will have nothing to regret and will be secure in the knowledge that as the Friden Company prospers so shall you prosper. Always remember--the Friden Company is proud of you, its representatives. Be proud of it, your Company.

A FEW SALIENT POINTS TO REMEMBER

Never argue with a user or prospective customer. It does not pay. If you do not convince them you are right, you are discredited; and, often, if you do convince them, you will have made an enemy. In either instance, you are the loser. An argument is often the start of an irreparable misunderstanding and never yet has created confidence or friendship. It takes two to make an argument. Therefore, do your best to evade them with your user or a prospective customer.

Never, under any circumstances, make discreditable remarks about a competitive machine. Instead, always tell your user what a good machine the Friden Calculator is and what it will do for him. Don't run down competitive machines and tell him how bad they are compared to the Friden. Often the user will be inclined to agree with you, but he will defend the absent competitive sales or service man out of the spirit of fair play. Then, too, while you are knocking a competitive machine you cannot be complimenting or selling the good points of the Friden, for it is only possible for us to talk about one subject at a time.

Don't talk about your employer to others unless you can say something complimentary. Never reveal your employer's private business to an outsider as it can never do him any good and may cost him a sale of a calculator or perhaps even your position.

Never overcharge the customer for repair work. Make your estimates fair and your charges will be correct. It is against good judgment to charge for work or parts not used on a calculator. Since the user is not in a position to know what has to be done to the machine, he is depending on you for fair treatment.

Make it a rule not to smoke in a coustomer's office or building. Above all, don't take a drink, even one, while on duty or during working hours--not even to be sociable. It is always easy to refuse in a nice way. The time to have a good time is not during working hours but after work.

TRAINING CENTER RULES

Hours: Week days - 8:30 A. M. to 5:00 P. M.
Saturday - 8:30 A. M. to 12:30 P. M.
Week Days Lunch Time - 11:45 to 12:15

While attending the Training Center you are under our jurisdiction.

If you can't report for work at anytime you are to contact this office by phone.

You are responsible for the neatness of the working area occupied by you.

You are responsible for the care and condition of the tools assigned. Keep account of them at all times. If some other student borrows one, be sure to get it back and if you borrow one be sure to return it.

Smoking is allowed at the benches. Cigarettes are not to be placed on the parts trough on front of bench. Ash trays are provided. Keep ashes off bench and out of machine.

Parts may be taken from the parts pans for your study or use on the machine, however put any excess parts back in the proper place. If you take a part and notice that the supply is low, one or two parts left, notify the instructor so he may order more. Keep the parts in order and keep the pans pushed back in the shelves.

When using the Drill Press, Grinder, etc., on the front bench clean up after you are finished.

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LUBRICATION CHART

Types of Lubrication to Use:

GREASE: Aeroshell Grease AN-G-15

OIL: Good Grade Oil, very light, non-gum forming or Aeroshell Fluid 3 - Spec. AN-O-6A

GREASE FOLLOWING:

1. Main Drive Shaft Cams and Gears
2. Counter Oscillator, Pin, Rocker Arm Adjustments Stud on Counter at Rocker Arm
3. Division Control Gear Shaft Cams, Oil Bearings
4. Division Centralizer

OIL FOLLOWING:

1. Shift and Return Clear Clutches
2. Oil Accumulator Dial Bearings, Counter, and Accumulator Shafts
3. Carriage Shift Gears
4. All Rollers
5. Mult. Feed Pawl Cam and Eccentric, Super-Matic
6. Mult. Unit Shift Pawl and Cam - Super-Matic
7. Main Drive Shaft Bearings
8. Actuator Shaft Bearings; Top and Bottom
9. Selection Gear Shaft Bearings, Top and Bottom
10. Carriage Rollers, or Bars
11. Idler Gear Shaft Bearings
12. Motor and Pinion Shaft Bearings
13. Automatic Clear Cam and Slide. (Light Coating)
14. Transfer Levers

OIL all Bearings & rotating parts not mentioned above. (Avoid over-oiling)

CAUTION

Only one drop of oil in Motor Cups every six months. (Avoid over-oiling of Motor.)

Do NOT oil Selection Gears on Selection Gear Shafts. When oil is noticed on Selection Gear Shafts, remove with Cleaning Fluid.
Do not oil Mult. Setting Levers, Super-Matic.
Do not Grease Slide Surfaces.
Keep excess oil from Add-Subtract Gear Shafts.

SERVICE RULES TO REMEMBER

The customer is our employer; treat him right, protect his property and respect his rights.

Conduct yourself as becomes a member of the FRIDEN Family.

Promote the name FRIDEN by leaving the customer happy that you called on him.

Improve your WORK REPUTATION by making every job your masterpiece.

All parts must be absolutely free of all binds without springs.

Never leave a screw loose to free a part. If a part binds, find out why and correct it. Loose screws can cause you an unnecessary amount of trouble.

Tighten screws when assembling parts and you won't forget them.

See that all Pins are in tight.

See that all springs are in good order and properly attached.

Never use force when assembling parts or sections; when properly aligned, parts will fit perfectly.

Learn to trace out each operation so you will understand the importance of each individual part, screw and stud.

Basic adjustments are very important to the proper operation of all Models of the FRIDEN Calculator.

Keep machines perfectly lubricated but do not over-lubricate. Oil in the Bearings is all that does any good. Excess oil merely serves to catch dust and dirt.

Whenever Service Letters or new parts are issued, do not skim over them. Take time out to study them, to reason why the changes have been made. This is the only way you are going to keep up with what is going on.

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STUDY METHOD SUGGESTION

The job of you the student does not end with the learning of the material presented in the Training Center to the point of perfect repetition in an examination.

Your job ends only when the material has become so much a part of you that you use it effortlessly in solving problems which come up in your daily work.

Then and only then can you say that you have "learned."

Up to then you have merely studied.

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USE THE LEARNED MATERIAL

You will not remember material unless you review it.

The best way to review is through use.

REVIEW YOUR MATERIAL FREQUENTLY.

Keep a list of the difficult points in your studies as you go along.

Points that are difficult will be under-learned and easily forgotten.

STUDY WITH THE INTENT TO REMEMBER

Remind yourself as you study of the fact you are going to be called upon to use what you are learning. Especially later, when you are in the field.

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If you want to remember what you learn, use it as frequently as you can, make your reviews cover the more difficult parts, especially well, and learn with the intent to remember.

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HOW TO BE AN OUTSTANDING FAILURE

1. Show no initiative.
2. Never accept responsibility for a decision if you can avoid it.
3. Be so impatient for advancement that you fail to learn what your present job has to offer.
4. Be arrogant, haughty in your manner.
5. Never bother to find out specifications for your job, nor measure your performance.
6. Be sure to start or lead Gripe or Grouse sessions.
7. Always talk, never listen.
8. If a superior gives you advice, endear yourself to him by letting him know you really don't need it, because you know everything already.
9. Develop your ability to pass the buck.
10. Get into office politics, preferably with both feet. If there aren't any, start some.
11. Expect the Company to do everything for you, but don't do anything for them.
12. Be sloppy in your dress.

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PARTS GUIDE

This is good information for you, not only now but later, and is REQUIRED to be learned. It will help in locating parts from the Manuals and the parts pans, and in ordering parts for your Service Department.

Springs	1000	thru	1100	series
Screws	2000	"	2200	"
Nuts	3000	"		
Washers; Rollers, Clips, Spacers	4000	"	4200	"
Studs	5000	"	5300	"
Bushings	6000	"	6100	
Pins, Rivets	7000			
Base, Motor	10000			"
Covers	10500			"
Right Frame	20000			
Left Frame, Bearing Plates	30000			"
Division	40000			"
Counter	40500			"
Drive	50000			"
Actuator	50500 & 50800			"
Control Plate	60000			"
Shift	70000			"
Key Section	80000			"
Selection	80500			"
Carriage	90000			"

As a general rule you will find, when the second digit from the left of a Part Number from 10,000 to 90,000 series is a "ZERO", the part is of the older or Basic Machine; if a figure 'ONE', the part is peculiar to an 'S'-ST-STW Machine; if a figure 'TWO', the part is peculiar to the Hand Model; if a figure 'THREE' the part is peculiar to an F or FT; if a figure 'FOUR' or 'FIVE' the part is of a Late Model, the Grey Case C-D-FT-S-ST-STW or modifications to Basic Parts. ('FIVE' is mostly Four Point Shift.)

Complete assemblies in the Parts Manuals are underscored thus 41550 and will consist of all parts indented and listed below. Part numbers ending in 5 or 0 denote Sub-assemblies and will consist of two or more parts or a part and a stud riveted together, except in cases of parts numbered 1000 to 7000 inclusive.

The letter T after a part number denotes the part is used on a 10-bank machine and is part of the number.

(EXAMINATION WILL BE GIVEN)

REPLACEMENT OF COUNTER OSCILLATOR CAM

The Counter Oscillator Cam can be replaced on the Drive Shaft without changing the Drive Shaft.

Remove Control Plate.
Remove Shaft from Counter Oscillator Arm (Wobbler).
Leave Wobbler in.
With Main Clutch still in place drive out Pin in Oscillator Cam.
Remove Clutch and Outboard Bearing.
Remove Cam from end of Drive Shaft.

It is best to have several of the Cams on hand to insure obtaining proper fit to the Drive Shaft. The Cam that is on the Drive Shaft has been pinned with that Shaft and the new Cams have been drilled and reamed separately, therefore it is necessary to find a new Cam that will have the Pin hole in the same alignment with the old Cam that is being removed from the Drive Shaft.

Should a new Cam be placed on a Drive Shaft and the Pin holes do not align and the Pin is forced in the Cam can be forced out of time, either advancing the Drive Shaft or retarding it. The backlash between the Back Pawl and the Counter Rocker Cam on left side of machine should remain the same.

To check for proper alignment of the Pin holes between a new Cam and the old one, insert a Pin in the old Cam, after it has been removed, and a pin in a new Cam and hold alongside each other and observe how the Pin aligns in the center of the hole in the old Cam, whether it is off a little to one side or the other, and then check the new Cam for same alignment of Pin. Keep checking Cams until you find one that you believe will fit, then make sure the Pin will drop into the new Cam so the large end of the Pin is below the surface of the Cam. Install the new Cam, align the hole properly, insert the Pin, finger pressure only. If the holes are in proper alignment, then the Pin should fit so the large end is under flush with the Cam surface. If this is the case, then the Pin can be driven in safely. If the pin does not go in flush or sticks out .030 or more, do not drive the Pin for it will force the Cam out of time. Be sure to have outboard Bearing and Clutch in place when driving Pin into Cam.

TRACING OF BINDS

Proper analysis and method of tracing out of parts that are causing Binds is important. A part that is binding can cause the machine to fail in functioning properly and must be located properly before any attempt is made at correction, because improper attempt at forming or aligning a part may result in additional difficulty.

Binds can be located by a process of elimination by using a small screw driver or spring hook as tools for testing the parts for freeness, also by use of the fingers. When testing for freeness of parts, use a "Light Touch," moving the parts lightly and gently and observe visually for free movement of the parts.

Start at one end of the group of parts and work along them, part by part, bearing by bearing. Do not hit and miss or jump around from one end of the sequence of parts to the other.

Check for parts being bent or rubbing together. Check shafts and bearings for free movement in all directions, and end play and free rotation of shafts.

Check for foreign matter, dirt, grease, and oil that may interfere with the freeness of any part.

Parts to be free without springs. After locating the point of bind, determine the proper method of correction. Flush the part to remove foreign matter, file or stone if necessary. If the part needs aligning, use the proper benders and use them properly.

* * * * * * * * * *

DISASSEMBLY OF MACHINE

The machine will be disassembled per following instructions and only the parts listed to be removed, or those mentioned by the instructor. There are reasons certain parts are NOT to be removed, therefore follow instructions.

REMOVAL OF TAPER PINS

As a general rule most Taper Pins are driven in from the bottom up or at an angle thereof, however there are some which are driven in from the top down or an angle thereof. Thus it is necessary to determine by observation first which is the large or small end before attempting to drive the pin. As you go through the machine try and remember which pins are driven out, and which way they are driven.

Remember: If any portion of the small end of the Pin is protruding above the surface into which it is driven, always use the Drift Punch (Flat End Punch), then use the Taper Punch when the Pin has been driven below the surface.

Remember: The first hit with the hammer is the important driving force to break the pin loose. Do not be afraid to hit it. Light taps at the beginning of driving the Pin will tend to mushroom the end thus making it impossible to drive the pin out.

If the pin is in a part which is next to a bearing support, it is not necessary to support the part unless the Pin is difficult in breaking loose or the shaft is thin, or the bearing surface is weak.

Always use a brace to support the part when the part is extended on a shaft away from a bearing surface, otherwise the shaft will be bent. Support when driving out or in.

If a pin should mushroom when being driven out do not keep hammering at it. File the damaged end and start again. If the end is filed flush with the surface in which it is driven then use the Taper Punch, but observe very carefully, before driving, for the end of the Pin, because it sometimes becomes blended into the surface in which it is driven and is difficult to see. You will run into difficulty if you try to drive out the Pin and not know where it is.

SNAP WASHERS

There are several types of Snap Washers and Spring Clips. These are shown on a card on your work space. They have different size holes for different size grooves, thus use the proper one. By observing the size of the groove, the proper clip may be used. A little practice and you'll become adept at this.

There are two thicknesses of the small Snap Washers because some grooves are thinner and a thin washer must go at the proper place or a part may bind.

The smooth side of the Snap Washer is placed next to the part and always spin the Snap Washer after closing to make sure it isn't binding the part or you may be looking for a bind at a later period.

REMOVAL OF CONTROL PLATE

Remove Control Plate per verbal instructions of instructor. Make sketch of Control Plate outline and mark in parts to be removed.

Practice of replacing Control Plate.

REMOVE COUNTER AND PUT ASIDE

REMOVE KEYBOARD AND PUT ASIDE

REMOVE REAR BEARING PLATE

Remove Right & Left Carriage Straps.
Remove Screws from Retainer; Remove Retainer & Springs (Top Front of Plate).
Invert machine so top of Bearing Plate is resting on pad and tap lightly with Plastic Hammer to remove as many Detent Balls as possible.
Place machine upright and remove screws from each end of plate & center Rear Screw.
Unhook spring from #41125, Shift Reverse Assembly.
Remove shift unlocking Cam & Bearing from #3 Actuator.
Remove plate - put aside.

REMOVE ADD & SUBTRACT GEARS, SHAFTS, TRANSFER GEARS. SCRAMBLE THEM.
REMOVE TABULATION MECHANISM.

REMOVE ADD & SUBTRACT GATE, VERBAL INSTRUCTIONS.(MAKE NOTES.)

REMOVE SELECTION GEARS AND SHAFTS. SCRAMBLE THEM.

REMOVE SHIFT DRIVERS FROM ACTUATORS, VERBAL INSTRUCTIONS. (MAKE NOTE)

REMOVE TRANSFER PIN BAR.
Remove a couple Transfer Pins and replace. Use Ball Pusher. (Ask for it)
(Note: On 10-bank Models the long Transfer pin is in the last position to left.
On 8-bank Models the Long Transfer Pin is next to last position to left.)
REMOVE TRANSFER PIN BAR.
Remove Bearing and Guide Plate.
REMOVE ACTUATORS AND SPRING TRANSFER MECHANISM.
LOOSEN SCREWS IN ALL LINE BEARINGS AND THRUST BEARING ON DRIVE SHAFT. REMOVE SELECTION LEVERS.
REMOVE MOTOR, RESISTOR, CONDENSER, DISCONNECT WIRING.
REMOVE SLIP CLUTCH FROM PINION SHAFT. REMOVE SCREWS FIRST.

REASSEMBLY

Replace Slip Clutch on Pinion Shaft.

Screw heads flush with Clutch Housing & Peen in Screws.

MOTOR

The following pages of information and sketches pertain to the Motor and its accessories. STUDY this well and check the references where given. Make notes where mentioned.

Use Motor Stand to study following information.

Wiring diagram, Page 11, Fig. 2, (Three Wire Motor-'B' Series) STW Manual

Sketch this diagram into the following space:

DIRECTION OF CURRENT (One Direction Only)

Into Contact Block to Yellow wire to Motor to Field Coils to Front Motor Brush Housing and Brush to Commutator and Armature to Rear Motor Brush Housing and Brush to Short wire to front Governor Brush to Inside Governor Ring to and through Governor Points to Outside Governor Ring to Rear Governor Brush to Black Wire from Motor to Left Side of Resistor to Black Lead Wire to Micro-Switch to Black Lead Wire to Left Side Contact Block.

MOTOR (Continued)

Condenser Wired across Motor to take care of arcing as such; Red Wire from Motor to Right Side of Resistor to Black Wire from Condenser; Yellow Wire from Condenser is the Common Lead and is connected to the Left Side of Resistor with Black Wire from Motor and Black Lead from Micro-Switch. This takes care of the Arcing of the Governor Points.

Other Black Wire from Condenser to Right Side Contact Block for Arcing of Micro-Switch. (This same wiring pertains to Contact Blade Machines.)

REMEMBER THE YELLOW WIRE OF THE CONDENSER IS THE COMMON LEAD AND SHOULD NEVER BE DISCONNECTED. THIS WOULD ELIMINATE THE CONDENSER FROM THE CIRCUIT.

MOTOR TROUBLES (Learn these, under the headings as listed, you'll be quizzed on them.)

MOTOR CONTINUES TO RUN AT NORMAL SPEED AFTER OPERATION.
 Check Contact Blades for sticking, or Micro-Switch sticking.
 Check for short across Blades or Micro-Switch.
 Check Condenser for short.
  Disconnect Black wire from Condenser to Contact Block.
   If this stops Motor, Condenser is bad. Replace.

MOTOR RUNS AT EXCESSIVE SPEED, NO ARCING AT GOVERNOR POINTS.
 Check Condenser for Short.
  Disconnect Black wire from Condenser to Red Wire from Motor at Resistor.
  If this stops the excessive speed, the Condenser is shorted and needs to be replaced.
  Check Governor Points for being Pitted so bad they can't break.
  Replace Governor.
  Check for Short across Governor Rings.
  Clean between Rings.
  (Note: If Motor runs at excessive speed for any length of time, check Geneva Points and proper setting to Actuators

---

MOTOR FAILS TO RUN.
 Check Wall outlet.
 Check Cord for being plugged in.
 Check Cord for breaks.
 Check Governor Brushes for sticking.
 Check Contact Points, and Wiring.

MOTOR RUNS BUT IS ERRATIC IN SPEED.
 Check Governor Brushes for sticking.
 Check Motor Brushes, and Governor Points.
 Condenser may have a break in its connections, therefore failing to function properly. Governor points will Arc.

MOTOR (Continued)

MOTOR RUNS SLOW - SMOKES - OVERHEATS.
Bad Coil.

MOTOR RUNS PART OF TIME BUT HAS A DEAD SPOT WHERE IT WILL NOT START.
Check for sticking brushes.
Check for dead coil.

MOTOR CARE
The motor needs very little oil, only one drop of light oil in each cup every six to eight months. The motor is equipped with LEDALOYL Bearings. These bearings are porous and retain oil for a long period of time and, for this reason, the oil hole is not drilled through the bearing. Excess oil on the motor bearings tends to foul the Governor and commutator Brushes and is one cause of sticking brushes.

GOVERNOR CARE
Governor Contact Rings should be kept polished and smooth. This may be done by using Crocus Cloth or very fine sand paper. In cases where the Governor Rings are badly scored and pitted, it is advisable to replace them with a new or re-built Governor. If oil and dirt appear on Governor, it should be removed and thoroughly washed in cleaning fluid. After cleaning or polishing the Governor Contact Rings, use a stiff brush to clean between the Rings to remove any foreign matter that might cause arcing or burning between them. A pencil eraser is good to clean the Rings also.

Governor contact points may need some attention, and in cases where pitting is not very severe, they may be filed or stoned to a smooth surface. If points are badly pitted, Governor should be replaced.

NOTE: Damaged Motors and Governors may be returned to the factory where they will be rebuilt at a nominal cost.

GOVERNOR ADJUSTMENT AND MACHINE SPEED
The speed on your machine to be set at a later time in the schedule.

Green Case Machines - - - - - - - - - - - - - - -	450 rpm
Grey Case Machines - - - - - - - - - - - - 495 -	500 rpm
STW- 495 -	500 rpm

The speed is controlled by the Governor Points which are adjustable. Turn small screw at Governor Point in to increase speed and out to decrease.

GOVERNOR - ALL FRIDEN MOTORS:
Set Governor on Shaft with approximately 1/32" between Rings and Brush Holders.

MOTOR (Continued)

DO NOT FORGET THE ABOVE INFORMATION ON THE MOTOR IS IN THE SCHEDULE. IT IS FOR YOUR BENEFIT TO KNOW AND YOU WILL BE QUIZZED ON IT.

References to Check NOW:
Service Letter #73, June 8, 1945
Service Letter #160, April 2, 1950
Make sketches of Brushes and information found on Brush Cards. Sketch on this page.

Make sketch of Five Wire - 'C' Series Motor on Page 11, Figure 1, STW Manual.

DIRECTION OF CURRENT: In Black White Tracer at Block to lower Field Coil to Front Commutator Brush through Armature and Commutator to Rear Commutator Brush to Short Red Wire (inside of Motor) to Front Governor Brush to Inside Ring through Governor Points to Outside Ring to Rear Governor Brush to Black Wire to Resistor to Yellow Wire to Upper Field Coil, through Coil to Yellow Black Tracer to Micro-Switch to Black Lead to Contact Block.

(Note: The 'C' Series Motor has longer Governor Brush Holders and used Longer Brushes. The Holders are positioned diametrically opposite each other, eliminates some radio static interference. The Field Coils are separate. A Split Ring Governor can be used where installation is made on DC current, it is not necessary but is preferable.

The 'C' Series is interchangeable in machines with the Micro-Switch, use the above diagram or Service Letter No. 160. It is not interchangeable with the Contact Blade machines. A special 'CS' Series with the three wires is made and can be had on order designating that it is a 'CS' Motor desired with three wires.

(Check Now: Service Letter #178 for change in Motor.) Make note of this.

Replace Motor, Condenser, Resistor, and Micro-Switch.

TIMING OF DRIVE SHAFT

Ref. Par. 4, Page 13 STW

ADJUSTING OF DRIVE SHAFT FOR FREENESS

Clutch in place as Clutch forms bearing on Right Side. Rotate Drive Shaft and tighten screws in Line Bearings one at a time and feel for binding of Shaft. If Shaft binds when a screw tightens, loosen screw and try another, etc., until all Line bearings are tight and Drive rotates freely without binds. LEAVE THRUST BEARING LOOSE.

(Never leave a screw loose to free a Drive Shaft. It may be necessary in cases to shim between the Front Bearing Plate and Line Bearing to free one up if it keeps binding.)

INSTALLING OF ACTUATORS

Ref. Par. 5, Page 13 STW

Place small amount of Grease on Actuator Gears before installing.

INSTALL SPRING TRANSFER MECHANISM

TIME & INSTALL SELECTION GEARS AND SHAFTS

Ref. Par. 6, Page 13-12

INSTALL BEARING AND GUIDE PLATE

Secure all screws that hold Plate.

ADJUSTING OF ACTUATORS FOR END PLAY

Ref. Par. 18, Page 17 - Lubricate Bearings

ADJUSTING OF ACTUATORS TO GENEVAS

Ref. Par. 19, Page 17

THRUST BEARING

Ref. Par. 20, Page 17

Purpose of Thrust Bearing: To remove Backlash from Actuators which would cause errors in Accum. Dials and an improperly adjusted Thrust Bearing would cause End Play in Drive Shaft which would effect the Counter Operation.

INSTALL TRANSFER PIN BAR

ADJUST CONNECTOR ARM

Ref. Par. 70, Page 26
Have Long Transfer Pin in Home Position.
Purpose of Adjustment: To obtain a fast action of the Flag moving into position, for contact by roller on #6 Actuator, when overdraft occurs. Wide clearance would cause delay of Flag moving into position and cause a failure of #40070 Assembly to operate for operating Add-Sub Gate.

INSTALL SHIFT DRIVERS; SHIFT CONTROLLERS

INSTALL TABULATION MECHANISM

INSTALL ADD-SUB GATE

TIME & INSTALL ADD-SUB GEARS; SHAFT; TRANSFER GEARS

Ref. Par. 7 & 8, Page 13 and diagram, Page 12 STW

DISASSEMBLE COMPLETELY THE REAR BEARING PLATE

Assembly: Install Disabling Bail & Walking Beam Interlock
Install and Time Shift Gears
Ref. Par. 10, Page 14 STW
Install Return Clear Parts

INSTALL REAR BEARING PLATE

Secure END screws and rear center screw first. Then give Add-Sub. Gears Shafts a "SPIN TEST." (Demonstration Given) Always do this SPIN TEST when installing a Plate _before_ inserting Detent Balls.

Clean Detent Balls before installing.
Install Springs - Small end down.
Install Retainer
Give Shafts another "SPIN TEST" to check Detent Action of Balls.

INSTALL REAR BEARING FOR #3 ACTUATOR

Lubricate Bearing

TIME SHIFT UNLOCKING CAM

Ref. Par. 22 1/2, Page 18, CW-DW Manual

SHIFT ENGAGING LINK

Ref. Par. 21, Page 17 STW
This adjustment is made with the SHIFT KEYS HELD DOWN

SHIFT ENGAGING LEVER-RETURN CLEAR

Ref. Par. 22, Page 17 STW
To make this adjustment, Latch Div'd Tab Key, Rotate Drive till Hook End of #71520 is on High Point of Thrust on Stud of #71440 then adjust per instructions.
(Make sketch of Hook & Stud of #71440 in Position.)

CARRIAGE CLEAR ENGAGING LEVER

Ref. Par. 23, Page 17-18
Position parts as in above instructions. Push Rod should not bottom at maximum thrust rearward. To have slight play between end of Rod and Engaging Lever.

INSTALL SELECTION LEVERS

Adjust for freeness - Demonstration Given
Adjust Per Par. 34, Page 19
Sketch a selection lever and note points to check for freeness.

MAIN KEYBOARD SECTION

Ref. Par. 33, Page 19, STW
To be made before next adjustment

STOP FOR KEYBOARD CLEAR GATE
Ref. Par. 35, Page 20, STW
Must follow Key Board adjustment.
Key Board clearing adjustment (explained)

CROWS FOOT ASSEMBLY
Ref. Par. 48, Page 22, STW

DIVISION STOP LEVER
Ref. Par. 52, Page 22, STW
Make sure Detent Lever detents properly in both up and down position of Stop Lever.

CYCLE LOCK PIN
Ref. Par. 54, Page 23
Cycle Drive half turn; place Gate in Add position; make adjustment.

INSTALL CONTROL PLATE
Secure Screws first; clips & pin all parts.
Timing of Division Control & Idler Gear
Ref. Par. 9, Page 14, STW
Make note of information regarding removal of Idler Gear

WOBBLER ADJUSTMENT - Par. 62, Page 24
Demonstration given by Instructor.
(Make sketch of adjustment and method of testing.)

RETURN CLEAR BELL CRANK AND TAB INTERLOCK
Ref. Par. 51, Page 22, STW
(Note) Form Lever E for adjustment in Fig. 3. Do Not Form Lever G as mentioned.

CLUTCH RELEASE LINK
Ref. Par. 49, Page 22

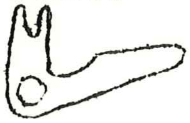
MICRO-SWITCH
Ref. Par. 47, Page 21
Align motor per instruction from Instructor.

Put machine aside for present time.

DISASSEMBLY OF CARRIAGE (STW AND ST)

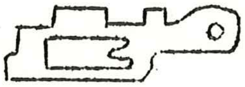
Disassemble per following instructions:
FIRST, to split Carriage to remove Accumulator Dial.
Place rubber band from Twirler to Dial Gears.

(W) - Remove Zero Lever
(Accumulator Stop Slide)



(ST Only) Remove Right End Plate
(Both) Remove spring on Division Stop, and Return Clear Stop on under side of Right end from stud on Frame.

(ST Only) - Remove Interlock Bar and Spring from Right End of Frame.



(Both) Remove Three Screws from Counter Zero Stop Slide.
(Both) Remove Counter Zero Stop Slide.
(Both) Back out two Screws in Carriage located under Counter Zero Stop Slide as far as possible.
(Both) Remove three Screws from Carriage Frame to left of Counter Clear Rack.
(Both) Remove Rear Screws from Left End Plate.
(Both) Split Front and Rear Carriage Frames.
Observe arrangement of parts on Frames, etc.

(The above is all that is necessary to do when replacing an Accumulator Dial. Remember this, you'll be required to do it again.)

NOW: Remove all parts from REAR SECTION.
Caution: Watch Detent Balls and Springs.

SECOND:

FRONT SECTION - REMOVING OF COUNTER DIAL

(ST Only) Turn #6 Dial to digit #3 and #7 Dial to digit #6.
(Both) Remove all Screws Securing Front Carriage Rail and remove Rail,
Caution: Watch Thrust Springs in Rail.
(ST Only) Place rubber bands from end of Dials to Transfer Levers.
(Both) Remove Window (Right Rail Brace) and Left Rail Brace.
(Both) Remove Counter Dials; Watch Springs and Balls.
Remove ALL parts from FRONT SECTION.

IDENTIFY ALL PARTS ON CARRIAGE.

REASSEMBLY:

Install Accumulator Clear Rack and adjust Retainers for FREE action of Rack. Remove all play possible. (To lower retainers, remove from frame and form down. To raise, pry up with screwdriver, BUT Not on teeth of Clear Rack.)
Have Instructor Check Rack before proceeding.

Install Bumper, Left End of Clear Rack. Adjustment will come later.

Install Accumulator Dials
Start from Left Side, use Detent Ball Pusher. Ask for it. Install Dials with zero up and with Hexagon Bearing parallel with Frame. (Watch this.)

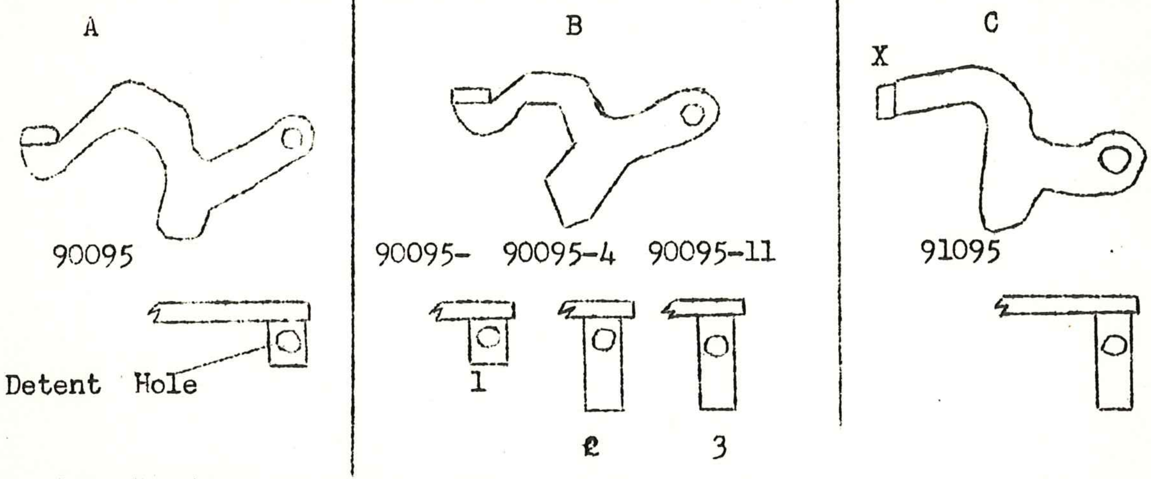
Install Front Section and Secure Long Screws. Care taken not to tighten too much, just snug.

Remove rubber bands.
Check Dials by spinning for freeness and Detent Balls working properly.
Have Instructor Check before proceeding.

Install Transfer Levers. Start from Left Side. Use Ball Pusher. Ask for it.
Install Accumulator Zero Stop Slide, Bumper, Zero, Stop Lever.
Install Optional Clear Slide.
Leave Carriage Shift Rack OFF.
(ST Only) Install Interlock Bar and Spring in Right End of Frames.
Install Right and Left End Plates.
(ST Only) Install Right and Left Brackets for Interlock Bar Actuating Gate and install Actuating Gate.
Install Rollers for Counter Clear Rack Studs.
Install Counter Clear Rack.
Install Counter Zero Stop Slide and Spring.
Install Bumper for Counter Clear Rack (Right End of rack to clear slot, adjustment later.)
Install Counter Dials.
Attach rubber band from end of Dial to Transfer Levers.
Install Window with Sensing Fingers & Right Rail Brace.
Install Front Rail.
Secure Rail at Left End, loosely, and swing Rail against dials and work dials in place. Have #6 dial at digit #3, and #7 dial at digit #6 (ST only).
Secure Right End and Secure Windows.

Install Automatic Return Clear Stop and Division Stop.

TRANSFER LEVER INFORMATION



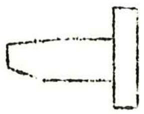
A - Old Style; used on early models.
Short Stud; Detent Hole close to lever.

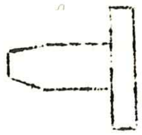
B - Later Style; Three Types:
1. Short Stud, Detent Holes Close to Lever
2. Long Stud, Detent Hole Close to Lever
3. Long Stud, Detent Hole further from Lever

(1 and 2 interchangeable if end of Long Stud is ground off.)
(2 and 3 not interchangeable because of Detent Hole positions.)

C - Present Style; Lip (x) position is changed. Long Stud, Detent Hole same as 3B. (Not interchangeable with 3B unless all Levers are changed.)

If 91095 Levers are put on in place of 90095-11 the Stud at extreme left must be changed. The Stud for 91095 is larger.


5022 Old


5322 New

CARRIAGE ADJUSTMENTS
(Carriage Off)

TRANSFER LEVERS

Ref. Par. 55, Page 23

COUNTER CLEAR RACK

Ref. Par. 37, Page 20

RIGHT HALF ACCUMULATOR CLEAR RACK

Ref. Par. 38, Page 20

OPTIONAL CLEAR SLIDE

Ref. Par. 42, Page 21
Must be made after Par. 37-38

ACCUM. DIALS ZERO STOP SLIDE

Ref. Par. 44, Page 21

ACCUM. ZERO STOP SLIDE ACTUATOR

To be given by instructor
(Make notes and sketch

COUNTER ZERO STOP SLIDE

To be given by instructor
(Make notes and sketch)

ALIGNING CARRIAGE TO MACHINE

Ref. Par. 56, Page 23
Read over but follow the written instructions here. This is a sequence setting, step by step, to properly align Carriage.

#1. Have both Rear Straps and both Front Straps loose.
#2. Check straightness of Carriage Support Bar. Not to be bowed to rear at center.
#3. Install Carriage.

Transfer Levers to be set for a .010 to .014 clearance to front collar of Transfer Gear.

To adjust: Move Carriage Support bar front or rear. Right end moves front to rear only.

Left end moves front to rear for Transfer Lever setting and up and down for leveling Carriage.

Adjust Transfer Lever setting first. On machines with the lips of Transfer Lever perpendicular to Carriage frames the Carriage can be set so there is equal clearance each side of Transfer Lever Lips to collars on Transfer Gears. This will give a .010 to .014 clearance.

On machines where the lips run parallel with Carriage frame the setting is .010 to .014.

To check for Transfer Lever setting being equal, carefully observe through the setting from one end and move Carriage to rear carefully at opposite end. If the light increases and equals -- one end is high the other low. Observe from both ends and test. When one end increases and the other doesn't and then checking from opposite end and same conditions exist, the Carriage is level.

#4. Level Carriage.

Left end of Support Bar is adjusted up and down so there is no rocking of Carriage. Have Carriage in Center to test.

#5. Adjust Front Straps one at a time for minimum clearance and free action of Carriage.

#6. Adjust Rear Straps on at a time.

Carriage to be free running without up and down play or back and forth play.

File off clamps if tight.
Peen if loose
(Demonstration given)

CARRIAGE SHIFT RACK

Install Rack
Ref. Par 57, Page 23

EXTRA TRANSFER SHAFTS BEARING

Ref. Par. 58, Page 23

CARRIAGE STOPS

Ref. Par. 30-31, Page 19

CARRIAGE SHIFT RACK CLAMP

Ref. Par. 32, Page 19

OVERRIDE PAWL STOP

Ref. Par. 25, Page 18

CARRIAGE CLEARING ADJUSTMENTS

LAST ORDER POSITIONER

Ref. Par. 45, Page 21

Following five adjustments are sequence:

(1) OPTIONAL AUTOMATIC CLEAR PAWL

Ref. Par. 46, Page 21
Adjust per following:
9's in Dials. Depress Ret. Clear Key. Rotate Crank slowly till Clear Slide is at maximum travel. Adjust Clear Pawl by Eccentric B so end of Clear Racks are approximately .020 from rubber bumpers in end plate.

(2) SPLIT CLEAR LATCH

Latch #91675 (Pg. 77) is adjusted by Eccentric to allow Left Half Accum. Rack to Clear Dials from 9's to Zero.

9's in Dials; Depress Return Clear - Rotate Crank slowly, Left Dials to reach Zero and Optional Clear Slide to have .010 to .020 further movement to the end of its travel.

This is the overthrow for the safe clearing of Dials.

(3) LEFT BUMPER FOR OPTIONAL CLEAR SLIDE

Ref. Par. 43, Page 21

With Optional Clear Slide at extreme travel by Hand Crank in Return Clear Operation adjust bumper per adjustment Clearance of .001 to .005.

4. LEFT HALF ACCUM RACK BUMPER

Ref. Par. 41, Page 21
With Optional Clear Slide at extreme travel by Hand Crank in Return Clear Operation adjust bumper for no pressure or clearance to Stop B.

Purpose of adjustment: To keep Left Rack from bumping into Right Rack and moving it when the Right Rack is locked in non-clearing position which may spin a Dial.

5. LEFT HALF ACCUM RACK (INSIDE END BUMPER)

Ref. Par. 40, Page 20

ACTUATING LEVER FOR RIGHT SHIFT

Ref. Par. 26, Page 18

CARRIAGE CLEAR KEY

Ref. Par. 50, Page 22

SEQUENCE ADJUSTMENTS

ADD-SUBTRACT GATE CENTRALIZER

Ref. Par. 60, Page 24

This paragraph really has three parts. To be checked and set in the following order:

First: Four point of Contact
Arms A & B in sketch hold the Add-Sub Gate steady.
Lower Arm B contacts bottom of lip on Centralizer and bottom of Stud on Gate Arm.
Upper Arm A contacts top of Stud and top of Screw C. Adjustment made at C.

Second: Straigtness of Gate.
Slowly mesh Add-Sub Gate manually and observe along line of Contact made by Add-Sub Gears and Dial Gears.
Gears to contact at same time along entire length of Carriage. (Demonstration Given for aligning Gate.)
Purpose: If Gate is not straight, the Add-Sub Gears can come out of mesh at one end or the other prematurely and may cause errors in Dials.

Third: Equal Clearance
Gate to be positioned by Centralizer for equal clearance between Add-Sub Gears and Dial Gears. Adjust per instructions in Par. 60

(Note: After making the Equal Clearance, check for point of Cycle Lock Pin riding the Center of the edge of Cycle Lock Disc.
If the Pin doesn't, an adjustment may be necessary, providing Gate is set properly.)

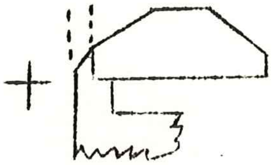
(Explanation given. Take Notes.)

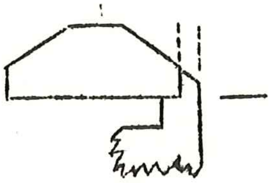
DIRECTIONAL CONTROL SLIDE - PLUS-MINUS

Ref. Par. 61, Page 24

Rather than use Straight Edge as mentioned, depress plus and Minus Keys equally so the holes in Key Stems show equal space above top edge of Control Plate.

Gears to have equal mesh in both Plus and Minus operations. That is, the Gears are not to mesh deeper on one side than the other.





CENTRALIZER ARM FOR COUNTER REVERSE

Ref. Par. 62, Page 24

ADD-SUBTRACT BUMPER ARM

Ref. Par. 63, Page 24

Purpose of adjustment: In Division Operation, to provide a limit for the travel of Add-Sub Gate from the Subtract Position to Add Position to absorb the bounce or to take the recoil from Gate so when it moves from the Add Position to Neutral it will not bounce past the Neutral which might cause the Dial Gears and Add-Sub Gears to pick up as Carriage shifted.

SHIFT KEYS INTERLOCK

Ref. Par. 64, Page 25

BELL TAPPER ASSEMBLY

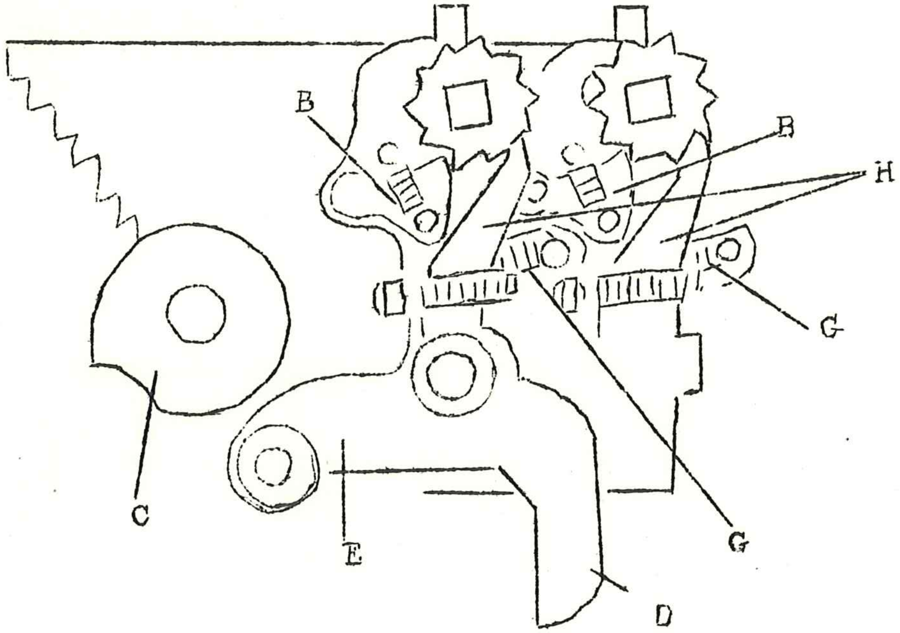
Ref. Par. 66

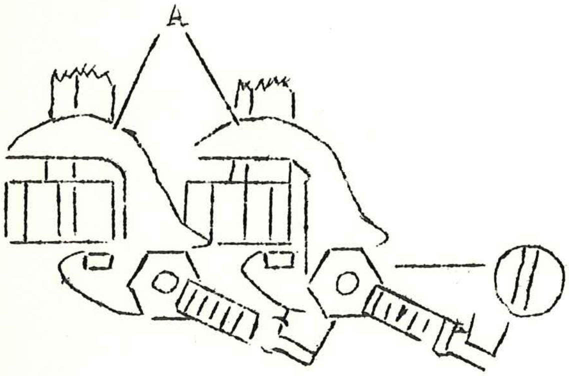
(EXTRA CARRY OVER (SPRING TRANSFER)

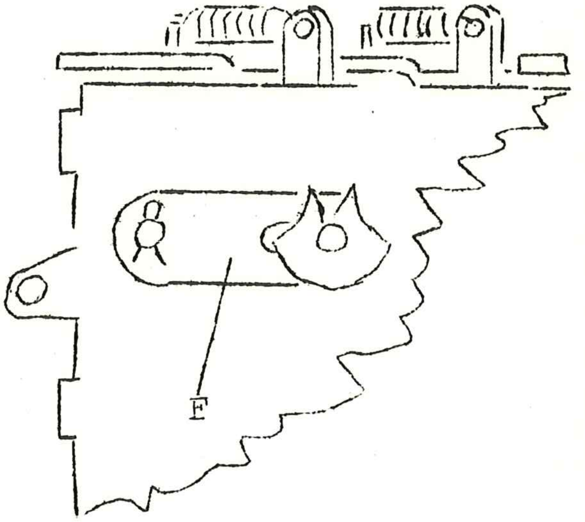
Tracing Operations

1. What is the purpose of Latch (A)?
2. What is the purpose of Pawl (B)?
3. What is the purpose of Cam (C)?
4. What is the purpose of Lever (D)?
5. What is the purpose of Arm (E)?
6. What is the purpose of Link (F)?
7. What is the purpose of Spring (G)?
8. What is the purpose of Lever (H)?

Note; **WRITE OUT ANSWERS TO ALL THE ABOVE QUESTIONS ON SEPERATE SHEET OR SHEETS OF PAPER.**


B
B
H
G
C
E
G
D


A


F

SPRING TRANSFER (Con't)

The Spring Transfer or Extra Carryover Mechanism is provided on Ten-Bank models only to increase the capacity for Accumulation in the Product Dials to fourteen places in place of twelve.

The #11 and #12 Add and Subtract Gear Shafts are Special, and are identified by a groove around the shaft next to the Detent Gear. They can be used only in these positions.

The #13 and #14 are special Ratchet Gear Shafts.

ADJUSTMENTS:

1. Latch (A) is adjusted to Transfer Levers (B) by forming Latch (A) for .010 - .014 clearance.

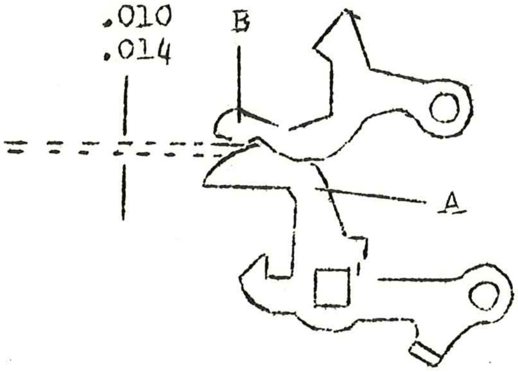


Fig. 1

2. Test for Latch (A) for bottoming by turning Dials so Transfer Cam (B) trips Transfer Lever (C) as shown and check for slight movement of Latch (A) away from Transfer Lever (C). Fig. 2. (Position Drive so Cam E, Fig. 3, is as shown for above test.)

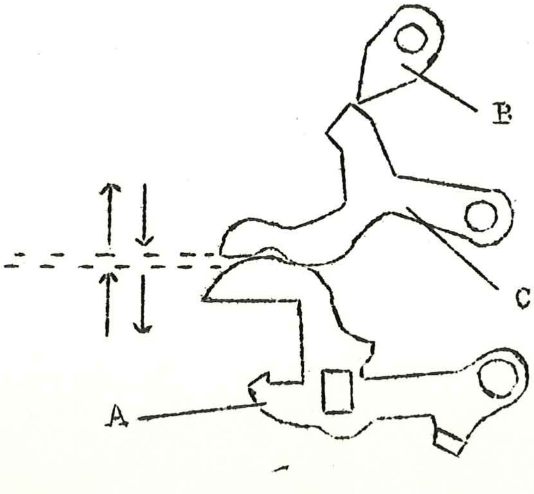


Fig. 2.

(Continued on
Next Page)

SPRING TRANSFER ADJUSTMENTS (Cont'd)

3. Levers (A) and (B) should have approximately .020 - .030 overlatch to Latches (C) when High Point of Roller (D) is on High Point of Cam (E) Form Lever (A) at (F) to raise or lower Roller (D). Fig. 3

Note: This is to allow the Trip Pawls (G) to relatch safely on Ratchet Gear (H). Fig. 4.

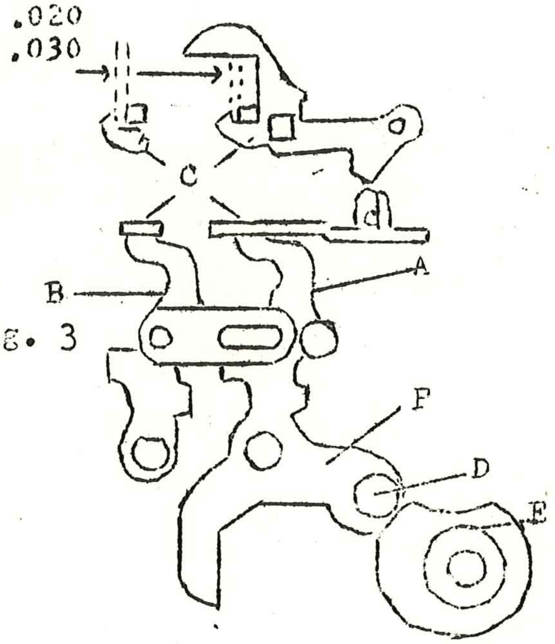


Fig. 3

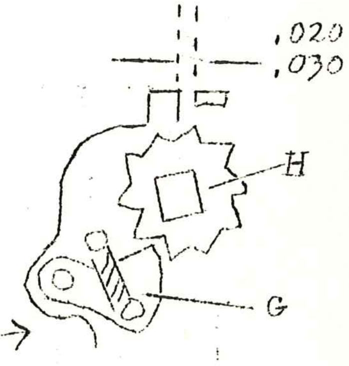


Fig. 4

There should be no Binds in any of the Extra Carryover Levers. This mechanism has to be free to function properly.

TESTING

#1 in First Column; Dials Clear. Carriage in First position. Depress Minus then Plus Keys rapidly. Observe 9's transfer in on Minus to 13th and 14th place and that all Zeros appear on Plus. Shift Carriage to Second position and repeat operation, then to Third and so on. Bell should ring on each Minus and Plus stroke.

SERVICE PROBLEMS; Extra Carryover

Failure to Carryover

Check for Weak or Broken #1094 Spring (G).
Check for worn Pawl (G).
Check for Adjustments 1, 2.

Continues to carry over in all operations:

Check upper end of Lever (B), broken.
Check for broken #1092 Spring of Latch (A), Latch (B), binding.

Leaves Errors: On older models in Division, that did not have Blockout Arm (D). Check for binds or weak #1094 Spring (G).

DIVISION

DIVISION CONTROL GEAR ASSEMBLY

DIVISION THROWOUT BAIL (Sequence #67-68-69)

Ref. Par. 67, Page 26

Purpose: To eliminate excessive end play so next adjustment may be made.

DIVISION THROWOUT ACTUATOR (FLAG)

Ref. Par. 68, Page 26

Dials Clear - Figure in K. B. Carriage in Center. Latch in Division. Rotate Hand Crank until Division Aligner Latches are delatched, continue to operate until Flag is tripped so the Roller is on high point of Flag and then adjust by Eccentric as directed.

Purpose: To allow #40006 gear to clear Pin before it rotates.

CAM FOR DIVISION THROWOUT

Ref. Par. 69, Page 26

Two parts to this adjustment:

First: Fig. 2, second paragraph.
Slide Cam up or down on shaft for .030 clearance.

Purpose: Excessive clearance would cause a delay of Flag moving into position for contact by Roller, therefore causing a failure of the Div. Control Gear to come out, thus no restoring of overdraft, no division operation.

Second: Not per instructions in STW Manual. Adjust per Service Letter #133 for Gear coming out into mesh.

DIRECTIONAL CONTROL SLIDE - DIVISION

Ref. Par. 72, Page 26

Purpose of Adjustment: To allow Gate to move equally in both directions in Division to obtain equal mesh of Gears. This adjustment must be proper to obtain the correct setting on next adjustment.

Remember - If this is changed, always check the following Centralizer adjustment.

CENTRALIZER ARM - DIVISION CONTROL ARM

Ref. Par. 73, Page 27

NOTE: To check this adjustment - Carriage off - operate by hand crank in Division. Position Gate at the neutral position during the Shift cycle then push up on Division Stop Lever to delatch Division parts. The Add-Sub. Gate should not move. If it moves, adjust Eccentric F accordingly. If Counter is installed, lift up on #1 Counter finger to disable it from the Counter Blocking Slide.

ECCENTRIC STOP FOR DIVISION CONTROL ARM

Ref. Par. 71, Page 26

NOTE: If Eccentric is adjusted too close to Control Plate, there will be a noticeable bind when operating in Division, by Crank, when the Control Arm moves from the Neutral to Subtract position.

Purpose of Adjustment: To make sure Control Gear will restore after a Division Cycle.

WOBBLER ACTION TEST

This is a test that should be made before operating machine under power and after making the preceding adjustments, or anytime after a new Wobbler has been installed. This check is made manually by hand crank. Latch machine in Division, (Carriage on or Off), and rotate manually, slowly, (hold Flag or Transfer Gear to operate Control Gear if Carriage is off), observe when the Add and Subtract Gate moves to the Add Position, the Upper Stud on the Wobbler Arm moves into race of the Oscillator Cam FREELY, and as Add and Subtract Gate moves into the neutral position, the Upper Stud moves up and out of the race FREELY and clears race before the Shift Cycle takes place; also the Bottom Stud engages race as Upper Stud clears race.

If the Studs on the Wobbler Arms do not clear the races or engage properly, they will chew the Oscillator Cam, and will cause the machine to misoperate in Division. Will also spread the Arms so the Studs do not engage properly.

(Continued on next page)

WOBBLER ACTION TEST (Continued)

On machines with Dual Division, Check with both Divide Keys depressed and again with only the Inside Key, or Negative Division. The Wobbler must function properly in Negative Division also. The movement of the Wobbler is reversed in that the Upper Stud moves up and out of the race when the Add and Subtract Gate moves to the Add Position and when Add and Subtract Gate moves to the Subtract Position the Upper Stud engages with the race and Lower Stud moves out. (Be sure to know and use this check, it is important.)

CLUTCH RELEASE SLIDE - DIVISION

Ref. Par. 74, Page 27

DIVISION STOP ON CARRIAGE

Ref. Par. 75, Page 27

NOTE: An extra cycle means the Clutch doesn't shut off soon enough at the end of division. The Division Control Gear should always be out after a Division operation is completed. It will restore on the next cycle of the machine.

BLOCKING ARM (EXTRA TRANSFER IN DIVISION)

Ref. Par. 76, Page 27

NOTE: Lever B, Fig. 1, to be centered in Stud A to obtain proper .030 setting.

PURPOSE: Deeper than .030 might cause the #13 Add-Sub Gear to become half cocked when the machine delatches in Division.

DIVISION SETTING LEVER

Ref. Par. 77, Page 27

DIVISION LATCH

Ref. Par. 53, Page 22

DISABLING CAM

Ref. Par. 78, Page 27

Note and remember this timing in case you ever have the Control Gear Assembly and shaft separated.

DIVISION ALIGNER
Shift Arms

(continued)

DIVISION ALIGNER (Continued)

1. LATCHES FOR DIVISION SENSING MECHANISM
   Ref. Par. 82, Page 28 (Sequence 82-80-81)
   Make this adjustment in Home Position of the assembly. Keep latches parallel with Add-Sub. Gate Shaft. (This is just a guide to follow.)

2. DIVISION SHIFT ACTUATOR UNIT
   Ref. Par. 80, Page 28
   Delete the .015-.030 adjustment in sketch. Left Arm B is adjusted only.

3. DIVISION SHIFT
   Ref. Par. 81, Page 28
   Two parts to this adjustment. Left Shift Arm B is first and is made in shift position. Right Shift Arm D is adjusted second.
   Keyboard to be clear - no number in it.

Sensing Mechanism

1. SENSING FINGERS ACTUATING LEVER
   Ref. Par. 85, Page 29 (Sequence #85 - 84)

2. SHIFT REVERSING BAIL - SENSING FINGER
   Ref. Par. 84, Page 28
   Have Keyboard clear - no number in it as mentioned.
   Make sure Latch B fully delatches when Dials are clear.

3. SHIFT REVERSING BAIL - DIVISION

   Ref. Par. 83, Page 28
   This adjustment can be checked at the same time as #84 - in a Shift Position.

CONTROL SLIDE FOR DIVISION THROWOUT
Ref. Par. 86, Page 29
Make adjustment per following, not per book:
Keyboard and Dials clear. Operate by Crank in Division Aligning. Outside Latch will delatch. Make adjustment of D when the Shift Actuator Unit is latched only by the Inside Latch and the Control Gear is restored to normal. Upper end of Flag B to have full bite on Roller C.

DIVISION SHIFT REVERSING LEVER
Ref. Par. 87, Page 29

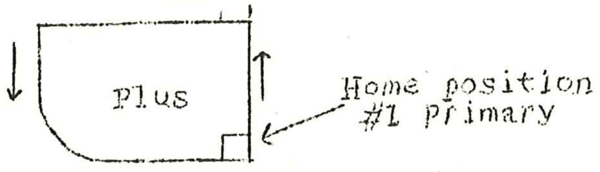
COUNTER

Read through the following on the Counter before installing. Use Counter Mock-up for observing operation of counter.

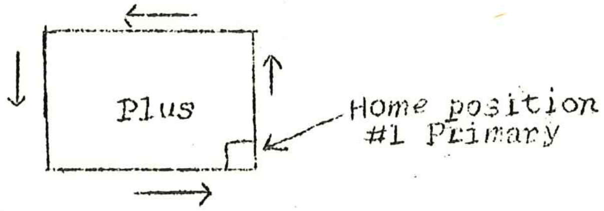
Motion of Counter:

Plus operation: Observing #1 Primary, the Counter A-bly moves to Rear by action of Counter Rocker Cam and Arm on Left Side of machine; then moves to Left when Primary Finger is engaged with Dial, turning to Dial, by action of Counter Oscillator Cam. Then moves to front and out of mesh with Dial by action of Counter Rocker Arm and Cam, then to the Right to Home position by action of the Oscillator Cam.

Motion on machines with One Piece Rocker Arm

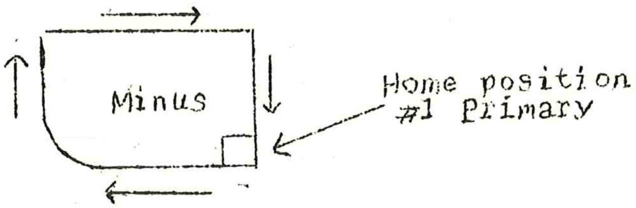


Motion of machines with Two Piece Rocker Arm

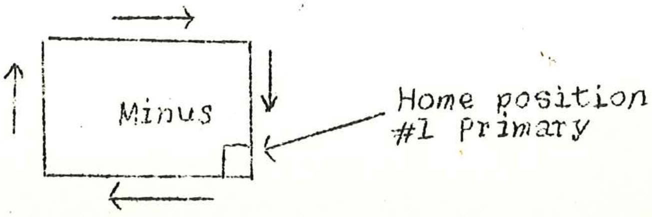


Minus ration: Counter Moves to Left first then toward rear and in mesh with Dial, then to Right, turning Dial, then to front out of mesh to Home position.

Motion on Machines with One Piece Rocker Arm



Motion on Machines with Two Piece Rocker Arm



The Counter consists of the #1 Counter Tooth and Lock Assembly, Fig. 1. And the Counter Transfer Fingers Assembly,

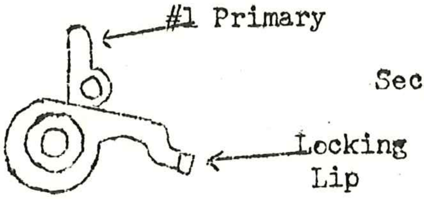


Fig. 1

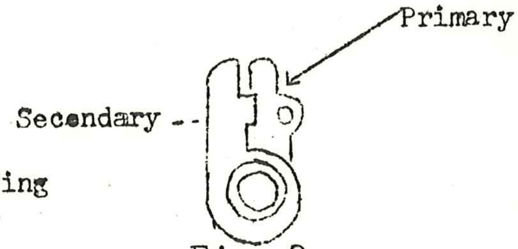


Fig. 2

The Counter Tooth and Lock Assembly (Fig.1 above) consists of a Primary Finger or Counting Finger and a Locking Lip. The #1 Primary Finger Counts in all calculating operations in any Carriage position. The Locking Lip stops the Counter from operating when the Add and Subtract Gate is in a neutral position during Shift operations.

The Counter Transfer Fingers Assembly (Fig. 2 above) consists of a Primary Finger and a Secondary or Blocking Finger. The Blocking Finger (A) moves against the Blockout Disc (B) of the Counter Dials, thus keeping the Primary Finger (C) to the left of that Secondary from engaging the Dial Teeth (D). (Fig. 3 below)

When the Notch in the Blockout Disc comes in line with the Secondary Finger (A), then the Secondary Finger moves through the Notch and allows the Primary (B) to left of Secondary to engage with the Dial Teeth (C) thus giving a Transfer.(Fig. 4)

When this Transfer takes place, the Secondary Finger (D), in line with the Primary making the Transfer, then moves against the Blockout Disc (E) thus keeping all fingers to left of it from contacting the Dial. (Fig. 4)

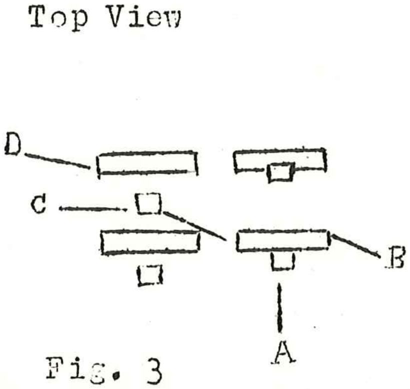


Fig. 3

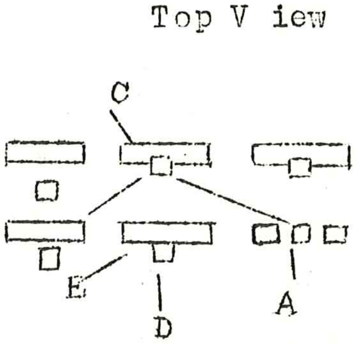


Fig. 4

COUNTER (Continued)

The Counter Fingers when on the Counter Carrier Shaft are not in a straight line, but form a Spiral around the Shaft. Fig. 1. This Spiral is very slight, approximately .004 on each Counter Finger Assembly. Fig. 2.

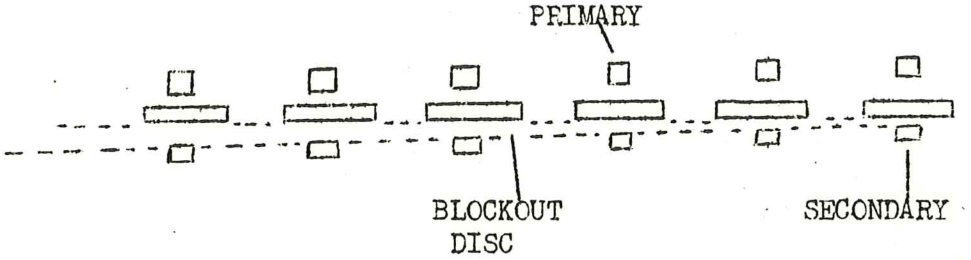


Fig. 1

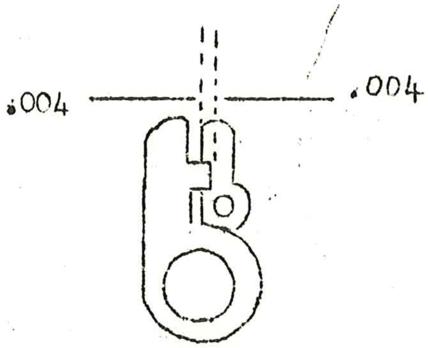


Fig. 2

The Purpose of the Spiral is to allow only one Secondary or Blocking Finger to contact a Blockout Disc at a time during a Transfer. Fig. 3

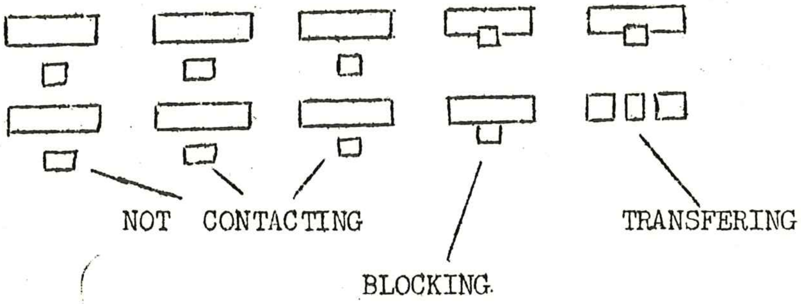
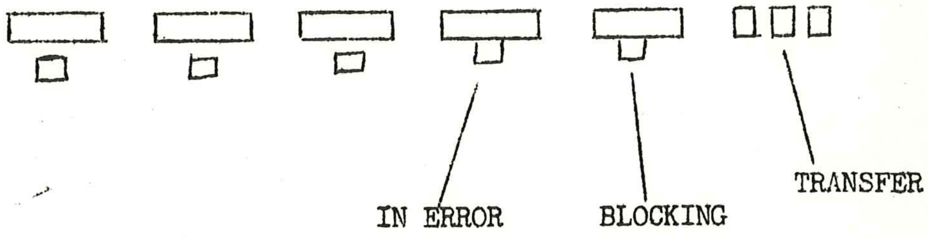


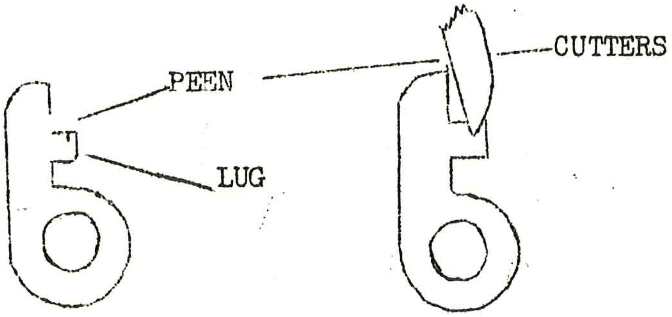
Fig. 3

COUNTER (Continued)

If more than one Secondary or Blocking Finger should contact a Blockout Disc, the possibility of a 'Flicker' or 'Secondary Pick-up' may occur, especially if there is a (9) in the Dial in line with the Secondary, which is in error or has lost the .004 spiral, which will allow the Secondary to rub on the Blockout Disc and catch in the Notch as the Counter operates, thus 'Flicking' the Dial or turning the (9) to (0).



To correct: The Lug of the Secondary in line with the Dial in error is peened slightly. REMEMBER, it is the Secondary in line with the Dial in error.



Primary Pick-up: A Primary Pick-up will occur sometimes on the Counter Dials to the left with the Carriage in the 1st, 2nd, or 3rd position. This will happen if the Primaries are bent or adjusted too far to the rear of the machine, thereby coming into contact with the Dial Teeth.

COUNTER ADJUSTMENTS
(Sequence)

#1 COUNTER ROCKER LEVER

Ref. Par. 88, page 30

NOTE: THE left hend can clear more than the .008. The right end should not have less than .010.

#2 COUNTER BLOCKING SLIDE

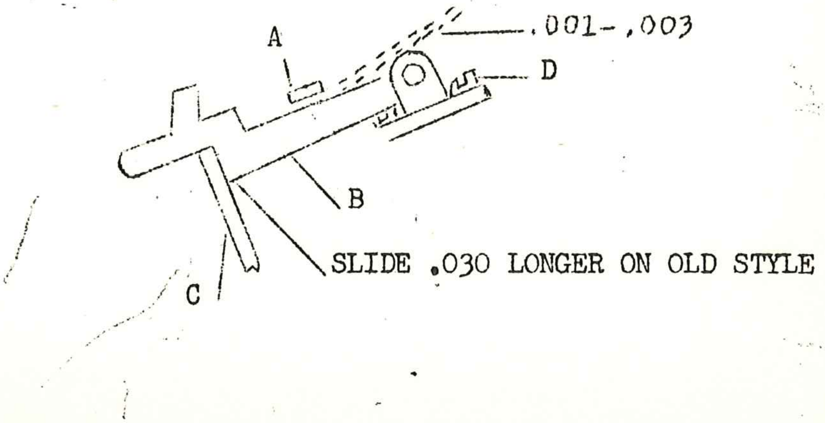
Ref. par. 89, Pgge 30

First part: If there is more than the .003 clearance between locking Lip B and Blocking Slide Point A after the above #1 adjustment, it is necessary to form the extension of the #1 Counter Finger Assembly to lower Lip B - Lip B to be straight at all times. this small clearance is necessary to keep the #1 Secondary Finger from moving rearward to contact Blockout Disds during Shift Cycle.

Second Part: Adjust Slide A per instructions: adjust Gate Stop E per instructions.

NOTE: There are two style of Counter Blockout slides and Retainer. The following sketch shows old style and method of adjusting. Know this and remember.

Adjust Retainer (A) for .001-.003 clearance to slide (B). Depress and HOLD down Minus Key. Adjust Blockout Slide (B) to Center Bearing Plate (C) by Screws (D) with no pressure or clearance.



COUNTER ADJUSTMENTS (Continued)

#3 COUNTER FINGER ALIGNMENT

Ref. par. 93, Page 31

#4 COUNTER OSCILLATING COLLAR

Ref. Par. 90, Page 30

COUNTER TESTS

After setting the Oscillator Collar Adjustment, test Counter as follows: Learn in this order.

1. With pressure on end of Shaft to right, depress Minus Key for a few revolutions, then the Plus Key: then with pressure to left, repeat operation. Counter Dial operated by #1 Primary should not fail to count. Shift Carriage to second position and repeat test, then to third position, etc. If any Dial should fail to operate; check for Oscillating Collar being in adjustment, check for Primary Finger being out of line. Check for defective Dial (Teeth may be out of line, Detent loose).

2. Secondary Pick-up or Flicker.

   Carriage in First position. Dials clear. Depress Minus Key to place all 9's. Turn next to last Dial to 8. Now Plus and Minus rapidly for a few strokes. The Dial to the Left of the 8 should show no movement. Turn this 8 to a 9 and move 8 to next Dial to right and repeat operation. If a Flicker or Pick-up occurs, peen the Secondary lug directly in line with the Dial in error. Peen lightly. Keep moving the 8 to the right and repeating the test.

3. Secondary pickup of Flicker Test.

   Carriage in first position. Dials clear. Put all 9's in by use of Minus Key. Add key Down. Move Carriage to last Position. Place 8 in next to last Dial by use of Minus Key. Place 1 in first column of Keyboard. Depress Division Keys. Observe as machine is DIVIDING the Dial to left of 8 shows no movement or turns to Zero. Repeat test by shifting carriage back to next to last position and moving 8 to next Dial to right and placing a 9 where the 8 was. Repeat division operation. If a Flicker or a Dial Pick-up occurs, peen the Secondary lightly that is in line with the Dial in error.

COUNTER BLOCKOUT BLOCKING LEVER (M.N.E.)

Ref. Par. 91, Page 30

COUNTER REVERSE LEVER

Ref. Par. 92, Page 30

COUNTER ROCKER LEVER (Machines with One Piece Rocker Arm)

With Carriage in First Position, adjust Rocker Lever Stud (A) (Fig. 1) to position #1 Primary (B) closer to Blockout Disc (C) than to Dial Teeth (D) (Fig. 2) and so the last Primary (E) has .008 clearance to Blockout Disc (F) (Fig 3).

NOTE: It is sometimes necessary when installing new Finger Assemblies or Counter Assembly that the Primaries on the left of the Counter need be filed on the front face to allow the Counter to be adjusted as above.

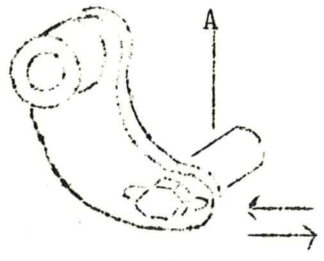


Figure 1

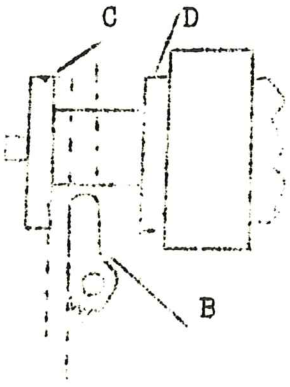


Figure 2
Right end

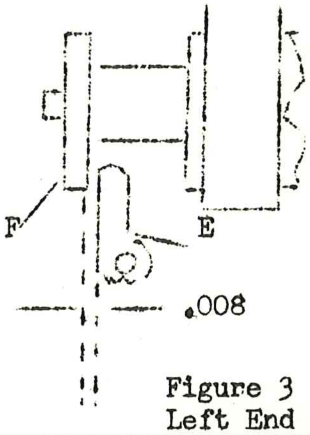


Figure 3
Left End

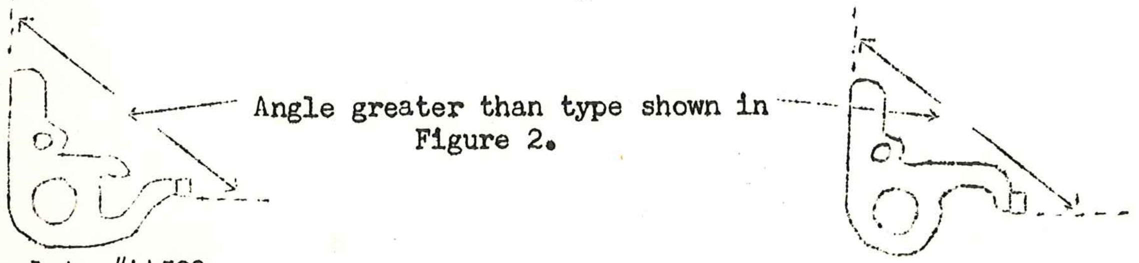
TIMING OF MACHINE SPEED

Place a (4) in First Column of Keyboard. Dials clear. Depress and hold Plus Key for 15 seconds. Set Governor Point Set Screw for 495-500 R.P.M.
(Accumulator Dials show the proper R.P. M.)

Information on Types of #1 Counter Tooth and Lock Assembly

Fig. 1 shows types found and used on machines that have a one piece Counter Rocker Arm Assembly. The part numbers are the same and they are interchangeable.

Fig. 1



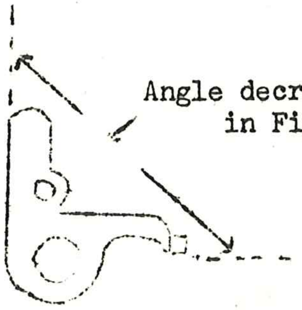
Angle greater than type shown in Figure 2.

Obsolete #44520

Present #44520

Fig. 2 shows type found and used on machines with a two piece Counter Rocker Arm Assembly. Late Gray Line and all W Line. Not interchangeable with #44520, Fig. 1.

Fig. 2



Angle decreased to type shown in Figure 1.

#44620

DIVIDEND TABULATOR

TABULATOR ACTUATOR LEVER

Ref. Par. 97, Page 32

Note: Lift up on Lever A to test for clearance.

TABULATOR SHIFT SET UP LEVER LATCH

Ref. Par. 95, Page 32

(1st) Last sentence only. Depress a Tab. Stop to hold Slide D down. Adjust Latch at 'E' to obtain clearance. This allows latch to move fully under Lip when in right shift.

(2nd) First two sentences: Twist at 'C' for adjustment.

TABULATOR SHIFT ACTUATING LEVER

Ref. Par. 96, Page 32

ADD*SUB. GATE DELATCH LEVER

Ref. Par. 98, Page 32

#1, Fig. 2

#2, Fig. 1. Rather than in normal position as mentioned, have a Tab. Stop depressed to hold Trip Lever A down past end of Lever B. Lever B when tripped manually should swing up and down so Lip will clear Trip Lever A .005-.015. Adjust by forming Lever C.

ADD-SUB. GATE RELATCH LEVER LINK

Ref. Par. 99, Page 32

ADD-SUB. GATE ACTUATOR LEVER

Ref. Par. 100, Page 33
Two Parts:

COUNTER BLOCKING LEVER ACTUATOR LEVER

Ref. Par. 101, Page 33

PLUS-MINUS GATE CONTROL ACTUATING LEVER

Ref. Par. 102, Page 33

TABULATOR KEY RELEASE LEVER

Ref. Par. 103, Page 33

STUDY OVER SERVICE PROBLEMS, Pages 49-50 on DIV'D TAB. If any question, make notes and ask about them. Learn these and you'll reduce your time on Tab. troubles.

Machine testing per Service Letter #176. Use tests that apply to what you have covered.

ADDITIONAL TESTS

300 TEST

Carriage in first position; Dials clear; Add Key up. Place in Keyboard 9876543211. Depress and hold Plus Key for 300 revolutions, in Counter. Dials show 2962962963300. Depress and hold Minus Key till Counter shows Zero. This test Selection: Transfer action, Geneva Setting.
Use the same Keyboard set up. Dials Clear, Carriage in first position. Operate Plus Key up and down till Counter shows 300. Same answer in Dials. Subtract out by use of Minus Key by operating it up and down. This tests the Full Cycle Lock Pin.
The above is for 10-bank set up. 8-bank would be 98765432. Dials would show 29629629600.

ALIGNER TEST

CARRIAGE in first position; Dials clear; Keyboard Clear. Place a '1' in first column. Twirl a '1' in Second Accum. Dial. Depress both Division Keys. Carriage to align one space past figure in Dial then Divide back. Leave figure in K.B. but move '1' in Dial to third Dial and repeat operation, then to fourth Dial till you reach 10th Dial.

Place a '1' in last Accum. Dial and a '9' in last K.B. column. Carriage first position. Divide. Carriage to align to 1st position and trip off both latches and divide out.

SERVICE PROBLEMS AND MECHANICAL ANALYZING

You will be given a few service problems to correct. These are not tricks, they are real problems. This is to help you learn the proper way to analyze the service problem.

Read over the following pages on Mechanical Analyzing.

MECHANICAL ANALYZING

This course you are taking is arranged into three steps. First: The mechanical operation of the machine. Second: The adjustments. Third: Analyzing.

You must know the first and second before you can Analyze. If you didn't, you would not know what you were looking for or where you were to start. In other words, you crawl before walking and walk before running. Since the first part has been completed and most of the second, we will now try to assist you in the proper method of analyzing.

One of the most important factors in servicing the Friden Calculator correctly and efficiently to the customers' satisfaction and to yours, is the proper analyzing of the service problems.

The following explanations and examples are designed to assist you to learn the correct method of analyzing.

> "Analyze" - To Separate mentally the parts of (a whole) so as to reveal their relation to it and to one another. To study the factors in detail, in order to determine the solution or outcome.

The above definition is exactly what you do. You separate mentally the parts of the machine to reveal their relation to each other and to the entire machine operation. You study each part and its action in detail, in order to determine the course of trouble and the solution to same.

When you start to analyze a service problem you want to determine what is happening that shouldn't happen. Of course to do this you must know what the correct action should be at the point of operation in question. To know this, you have to apply yourself in learning the mechanical operation at every opportunity.

Let's take a few sample problems. Read over these carefully and check your machine to see how these apply.

You have a failure of Accumulator and Counter Dials to clear on a Carriage Clear Operation with the Carriage Clear Key. Now you know when the Carriage reaches first position the Clear Racks are to move out and of course clear the Dials. Therefore, if the Clear Knobs are in the engaged position with the studs on the optional Clear Slide you check the action of the Optional Clear Slide. Now the Optional Clear Slide is actuated by #70445 Auto. Clear Actuating Slide (Page 72), contacting the #90445 Optional Auto. Clear Pawl (Page 77) which is attached to Optional Clear Slide, when #70445 is moved to right as Carriage moves into first position. #90445 must be free to drop off positioner into path of #70445 and be contacted by it. If this is proper, then the #70445 can be sluggish in restoring back to left far enough to allow #90445 to drop in front of #70445.

This has been assuming that the #70445 is moving back and forth in its proper action. Nowone of the first actions to observe is if the #70445 is moving. If it isn't, while the carriage is shifting to the left, then this means the #70430 Auto. Clear Cam Lever, Page 72, is not moving and this is moved by #70136, Kidney Cam; therefore, the #70072 Clear Clutch, is not engaged into the Kidney Cam and the #70072 is engaged by the push rod through the Shift Fork. The Push Rod is actuated to rear by the #71290 (Page 73), Clear Clutch Engaging Link, therefore the #71290 must be in contact with end of Push Rod when #71290 is moved to rear. #71290 may not be in contact by a bind or by #71285 (Page 58) or by Bail #71495 (Page 73) or #75155 (Page 79) or #71290 is not being held into position by #71325 and #71440 (Page 73) when #71440 is latched by #71344.

The above is the group of parts that would be checked which would effect the action of the Dials clearing. If you have observed the procedure of the above explanation, the procedure has been step by step, part by part, from the point of failure.

Another example. Let's take a Division problem. You have a Service Problem where the machine isin Division but is just running in the Subtract position much longer than it should and you notice a series of 9's in the Dials to the left of those in the Keyboard, which tells you the overdraft was accomplished but did not restore, therefore you ask yourself-- "What must happen to restore the overdraft?" Answer: "The Divisiom Control Gear must be actuated out into mesh with Idler Gear to move Add-Sub. Gate to Add or restore position; therefore the Division Control Gear didn't come out so the parts to check are those where the action starts that causes the Division Control Gear to mesh. Now where does this start-- The Transfer Action--therefore the Transfer Lever Setting, Transfer Gears, Levers, loose Carriage (effect transfer setting), the Connector Arm adjustment of .001--.002 (excessive clearance would cause a delay of flag to be actuated into mesh with Roller on #6 actuator) (excessive clearance causes delay of Flag to mesh with Roller) End play in Flag Clamps; broken Control shaft at Control Gear assembly; advanced timing of Control Gear in meshing with Idler Gear.

The beginning of this action is the Transfer action and the ending is the Control Gear meshing. Therefore, the parts between these two points would be the group to analyze. Again the method of analyzing has been step by step, part by part, in their proper action.

Every operation of the machine has a starting point and an ending point; each group of parts that operate and control a certain action has a starting and ending point; each part has a starting and ending point. Therefore, if you determine the malfunction, what is incorrectly happening, then you can use this point as a beginning for your analysis and start tracing back through the parts that control the particular operation in question.

Rules to follow:

Determine what is incorrectly happening.

Determine what parts control this particular operation
(Separate mentally the parts to reveal their relation
to the operation.)

Trace back each part.
(Study factors in detail; their action, adjustments,
binds, wear)

It takes time and experience to learn to qnalyze, so each time you have any type of problem, whether you make it yourself, or it's a regular service problem, follow the suggestions and rules given to practice analyzing. Remember you must know what is to correctly happen at any point during any operation, before you can determine what is incorrectly happening.

For a service man to correctly and efficiently repair a Friden Calculating Machine he must have a thorough mechanical knowledge of the machine.

This knowledge comes not only from experience but with proper application of the service man's mental ability for mechanical reasoning, his interest in his work and how proficient he wishes to become. Experience is the knowledge gained by one's own action and practice, not the length of time as expressed in years and months on a particular type of work, for one can spend years doing the same type of job and not gain anything concrete unless he has applied himself in an attempt ot learn everything possible at every opportunity.

Knowing the adjustments, their proper sequence, their clearances and points of adjustment is not enough, but is mandatory. One must know why the adjustments are made as they are; what they control; what they will cause if off, for some adjustments when changed will effect and destroy others

Whenever adjustments are changed for some reason of yours, be very sure you think ahead as to what this changing may effect, check to find out. Don't change adjustments and take it for granted everything is all right. You may get into more trouble than you bargained for.

The service man must understand that every operation of the machine is accomplished as the result of groups of parts, individual parts and sequence linkages that are actuated on each operation. The individual parts and sequence linkages each have apartioular job to do in setting up the complete operation and it is the combined action of those parts and linkages that the complete operation is accomplished. Therefor if one of the sequence linkages or individual parts is failing to function properly it will effect the proper function of the overall operation.

You, the service man, must know theoperation of the machine so well, you will know what is to exactly happen upon the depression of any operating key and what the resulting action is during the operation, that is, what should correctly happen during any phase of the operation.

If a machine fails to function properly during an operation, determine what should correctly happen, what didn't happen, and start checking from this point of failure.

We can only suggest to you--you have to do the thinking--we cannot do that for you.

A SERVICE TECHNICIAN IS ONE WHO HAS THE MENTAL ABILITY FOR MECHANICAL REASONING.

ACTUATORS

This information is to be learned. It compares the various style and type of A ctuators used in the machine: past and present . If you are in a one-man service Department, this is well to know for ordering or replacing actuators.

Use the ACTUATOR Demonstration Board to compare the following with the type of Actuators.

#1 Narrow Drum Actuator

Used on Old Green Case Models, very early, Single piece cover.
Fast timing.
Dural Drum (Narrow 9/16")
Small Bearing
Number of Actuators only symbol on durm
Small Geneva Hub

#2 Plain Drum Actuator

Used on Old Green Case Models, early models, single piece cover.
Fast Timing.
Dural Drum
Wider Drum (5/8")
Small bearing
Number of Actuator only symbol on Drum
Small Geneva Hub
Not interchangeable with Narrow Drum

#3 'S' Small Bearing

Use on Green CASE Models, 4 piece cover
Slower Timing
Dural Drum (Same width as Plain)
Small Bearing
Letter 'S' on Drum with Number of Actuator
Small Geneva Hub
Not interchangeable with Plain, because of Timing

#4 'S' Large Bearing

Same Timing as 'S' Small
Dural Drum (5/8")
Large Bearing
Letter 'S' on Drum with Number of Actuator
Small Geneva Hub
Not interchangeable with 'S' Small because of Bearing

#5 'X' Actuator

Same Timing as 'S'
Dural Drum (5/8")
Large Bearing
Letter 'X' on Drum with number of Actuator
Large Geneva Hub
Interchangeable with 'S' Large. May be necessary to file
out underside of Center Bearing Plate next to Geneva Hub

#6 Steel Actuator

Same Timing as 'S' and X
Steel Segments in Place of Drum
Large Bearing
Number of Actuator Stamped on Gear
Large Geneva Hub
Could be interchanged with 'S' large or 'X' if the
Selection Gears are Changed to Steel Gears

#7 REvised Steel Actuator

Same Timing as other Steel
Steel Segments
Smaller Bearing with Insert
Number Stamped On Gear
Large Geneva Hub
Interchangeable with other Steel by using Insert

Note: Bronze Selection Gears are used with Dural Actuators.
Steel Selection Gears are used with Steel Actuators.

Whenever you order AActuators be sure you designate the proper type, such as 'S' Small Bearing, 'X', Steel or whatever it may be. You will notice in the White Sheets on Actuators that the Part Numbers are the same for the Dural Type Actuators, therefore the necessity of proper designation.

* * * * * * * * * * * * *

REMOVAL & DISASSEMBLY OF MUL UNIT & KEYBOARD

Remove Mult Keyboard per Verbal instructions.
  Practice installing and removing.

Remove Mult Unit.

  Disassemble Mult Unit completely.
    Arrange Setting Pins in Piles. See how many different types there are.

Assemble Mult Unit Pin Board per verbal instructions and assemble unit complete. Have instructor check after completion.

A ligning of bearings of Mult Unit per verbal instructions

Timing of Unit Shift Shaft.
  Ref. Par. 12, Page 14

Timing of Dial Reset Shaft.
  Ref. Par. 13, Page 14

Install Unit & Align Restore Fingers
  Ref. Par. 109, Page 34

Instructions given.

Have instructor check before proceeding.

Install Keyboard

NOTE: Par. 11, Page 14

SELECTION SECTION ADJUSTMENTS

ESCAPEMENT BRACKET

Ref. Par. 104, Page 34

Have unit in Home Position. Setting Levers and first row of setting Pins to be flush on left side.
Be sure to keep Comb level. Approximately. .012 between top of Comb and underside of Angled Escapement Pawl.

MULTIPLIER UNIT SHIFT RACK

Ref. Par. 111, Page 35
Place zeros in Unit - Latch Mult. Correction Key and rotate Hand Crank.

BUMPER FOR MULTIPLIER UNIT-LAST POSITION

Ref. Par. 105, Page 34

ESCAPEMENT PAWL STOP ON BOTTOM PLATE

Ref. Par. 106, Page 34

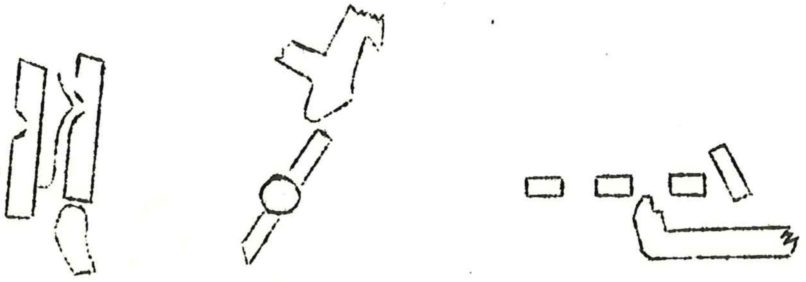
SETTING LEVERS AND SEGMENT RELEASE

Ref. Par. 107-108, Page 34

These two paragraphs give the setting and akjustments for the Pin setting and segment release, howerer the following explanation will clarify these and explain the setting desired along with the following sketches.

When a Selection Key is depressed the action desired is; 1st, the Setting Pin smaps into Place; 2nd, the Segment releases; 3rd, the Unit escapes. (Fig. 1) It is not always possible to obtain this action but in any case have the Unit escape last and the Pin setting and Segment releaseing as close together as possible.

Fig. 1



1st 2nd 3rd

AS a Selection Key is depressed the lower part contacts and actuates the Selection (Setting) lever so the Setting Pin is actuated into place; as this continues its downward movement the extended parts between the Top and Bottom plate move the Escapement Rod down which contacts and actuates the Segment RElease Link so it trips the Zero Latch from under the Segment to release it; the continued depression of the Key continues to depress the Escapement Rod so rear end actuates the Upper Escapement Pawl downward which actuates the Lower Escapement Pawl from the Teeth of the Comb thus releasing the Unit.

(1st) SEGMENT RELEASE LINK

Ref. Par. 108, Page 34

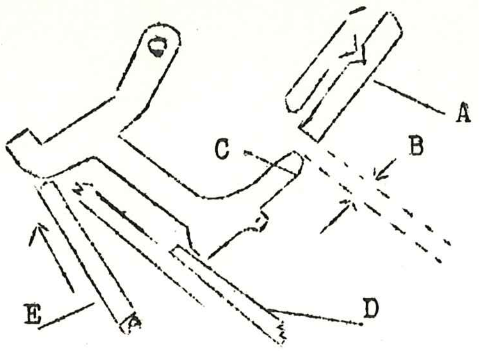
Note: To test Segment Release, Depress the #9 Key slowly.

(2nd) PIN SETTING ADJUSTMENT

Ref. Par. 107, Page 34

Depress all Selection Keys and check for Pin Setting--Segment Releasing--Unit Escaping. If pin does not set before the Segment releases on the 1-2-3 Keys, the Setting Levers on these keys may be lengthened to position the Pins faster.

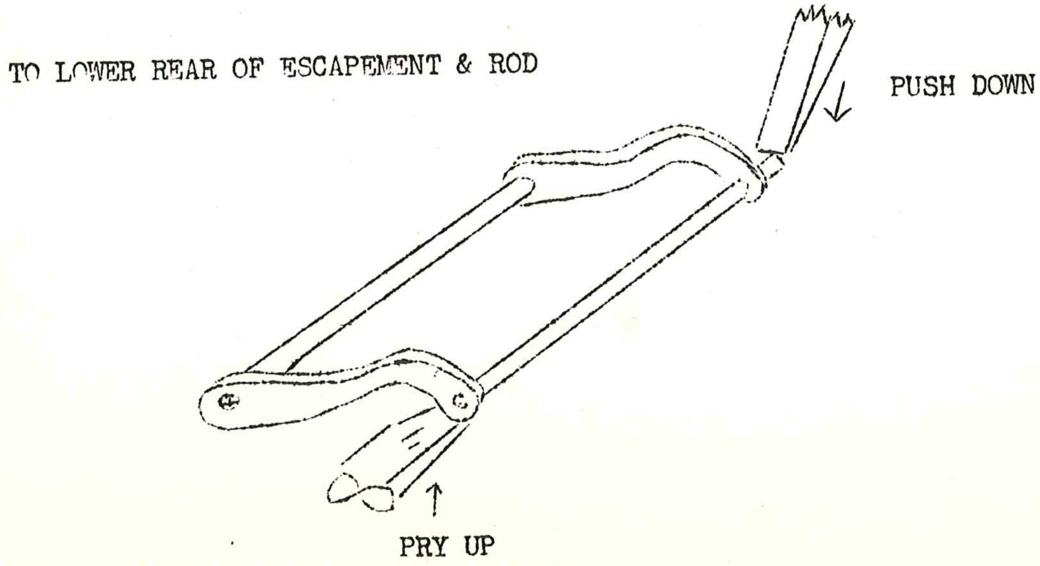
Note: Check for leeway to make the adjustment. Depress and hold Key in question, be sure Pin (A) is in place. If there is no clearance (B) between end of setting Lever(C) and Pin (A), then Lever can be adjusted. If no clearance, no adjustment can be made. Adjust by inserting a suitable object (D) as shown and tap on Setting lever with Punch (E) (Next Page).



If the Setting Lever is not long enough, the Setting Pin will not seat fast or far enough and if the Setting Lever is too long or you should adjust it too far then the Setting Pin will bottom which will stop the Setting Lever which will stop the Key from depressing the Escapement Rod far enough, thus not escaping the Unit.

If the #1-2-3 Setting Levers are too long they can be shortened by inserting a screw driver between the Setting Lever and Setting Pin and pressing down on the Key in question.

Sometimes the 4-5-6-7-8 Setting Levers are too long, thus causing a failure of the Unit to escape. It is necessary to obtain and escapement of the Unit by forming the arms of the Escapement rod to lower the rear end enough to cause the Unit to escape approximately at the time the Setting Pin bottoms. The lowering of the Escapement Rod at the rear speeds up the Unit escapement.



MULT. SEGMENT HOLDING PAWL

Ref. Par. 110, Page 35

To Test: Place 9 in first sector, depress Mult. Key, Rotate by hand crank.

PART CHANGES AND ADDITIONAL ADJUSTMENTS

Ref. Service Letter #184

MULT. KEYS RELEASE BAR

Ref. Par. 112, Page 35

Note: This adjustment to be proper before Par. 134 is made.

INFORMATION ON MULTIPLICATION SELECTION UNIT AND KEYBOARD

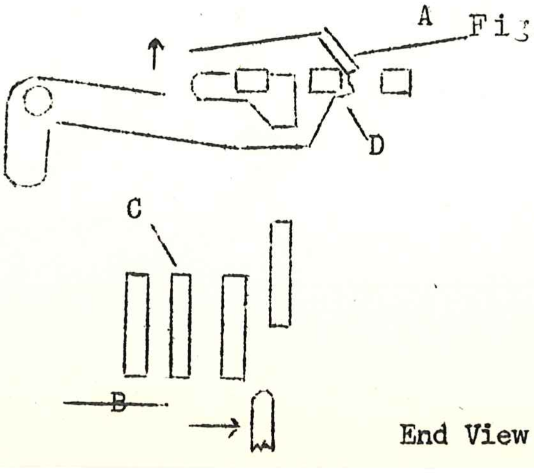
(Read over and study on Machine)

Remember to thoroughly check any difficulties or failures of the Unit to escape properly before attempting to adjust; You want to DETERMINE what is wrong first before making an adjustment.

This information is designed in an attempt to help you understand the escapement action and methods of correction in case of problems.

The Escapement consists of two Pawls and the Comb. The Upper Pawl (Fig1) has an angled Lip (A). This lip is so designed in length to allow the Setting Levers (B) to restore below the Setting Pins (C) before Lip (A), releases the Comb Tooth (D) in its upward movement. The length of the Lip should never be changed

Fig. 1



The two Pawls are positioned by their Bearings (A) on the bottom Plate (B) (Fig. 2) so there will be .005--.010 movement of the Unit to the Left on escapement in First position, due to the bottom of the first teeth of the Comb being wider than the rest.

If the Bearings of the Pawls are distrubed to cause the operating points to become closer, then the possibility of moving from 1st position is reduced. The .005--.010 movement will be destroyed.

A lock up of the Upper Pawl being caught in the Comb as the Unit Shifts to the Right in Multiplication will destroy the Bearing position (A).

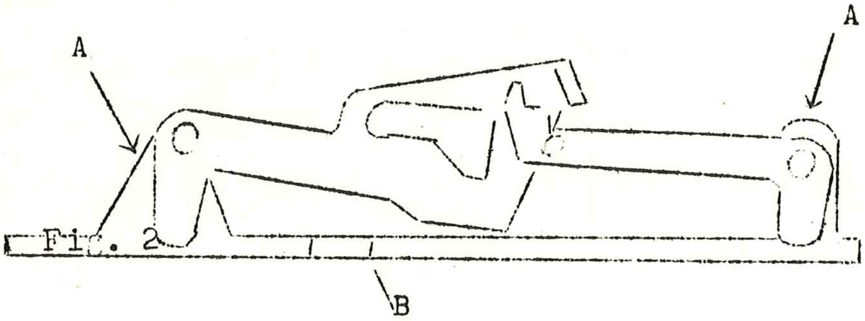


Fig. 2

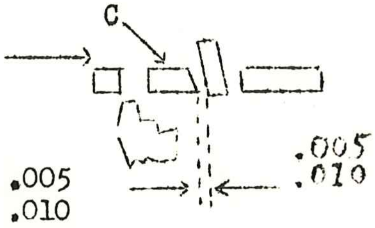


Fig. 3 (A) shows correct action of escapement.

Fig. 3 (B) shows incorrect action if distance of operating points of Pawls has been destroyed.

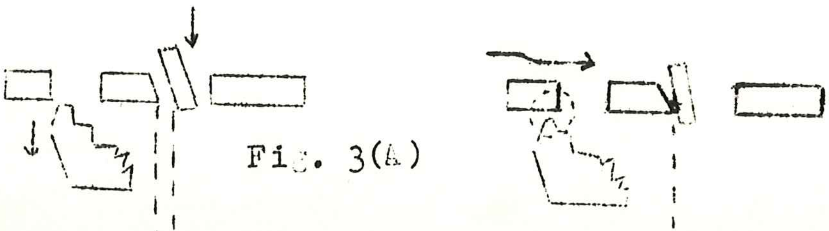
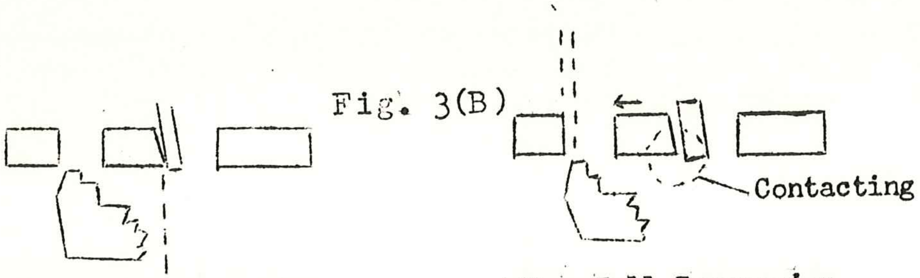


Fig. 3(A)

Just Before Full Depression

After Full Depression

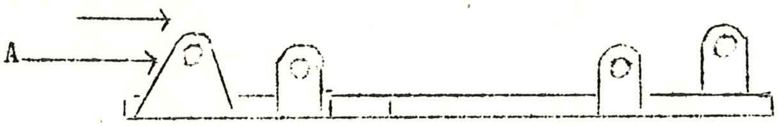
Fig. 3(B)

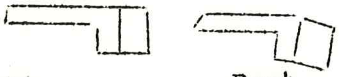


Just Before Full Depression

After Full Depression

To adjust Pawls for proper action if Unit fails to escape in First position, but escapes in others. Form bearing (A) of Upper Pawl to Left. Take care for Binds. Also check the angled Lip for being bent on the Upper Pawl.





The purpose of the first tooth of the Comb being wider on the bottom is to prevent the Lower Escapement Pawl from engaging in the first position when the Unit Shifts to the extreme Right Position.

Note: There has been a change on the Escapement Pawl and Comb. See Service Letter #164. The first tooth is the same width as the others on this style. The bent down lip and stud on Pawl keep the Unitfrom sticking into first position.

Failure of the Unit to Escape on Selection Keys, but escapes on the Zero Key.

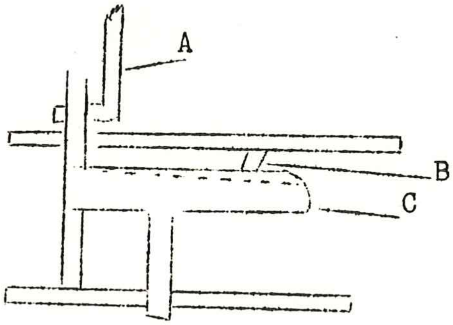
On the 1-4-7 Keys:

If the Unit fails to escape properly on the 1-4-7 Keys, check as follows:

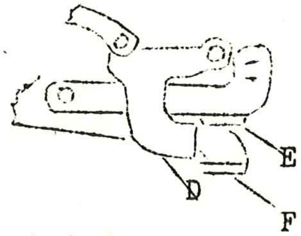
Depress Key slowly till STOPPED. Unit fails to escape. Hold Key down and depress Rod that extends through Keyboard. If this escapes Unit then the Extended Arm of the Keystem which operates the Rod is not depressing the Rod far enough.

Insert some suitable object (A) in Hole of Keystem above Top Plate and insert a screwdriver (B) between underside of Top Plate and extended arm of Keystem and form Arm (C) down. Take care on forming: interlock (D) will bind on interlocks (E & F).

Front View



Front View



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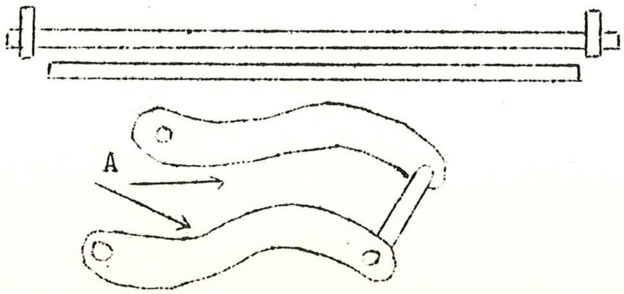
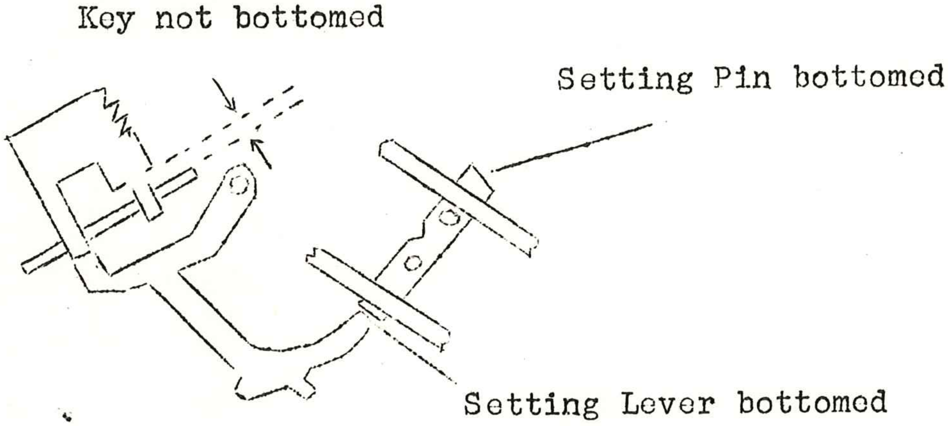
Selection Keys Bottom; No Escapement

(a) Depress Keys slowly till stopped. Press harder on Key if no escapement; then depress Rod, if Rod is bottomed, then check for rear of Rod being high at escapement pawl. Form front and rear Arms (A) of Rod to level it or to lower rear end slightly lower than front end.

Rod Level With Bottom Plate



(b) Slowly depress Selection Key. Key stops but with additional pressure the Unit escapes. Check for Setting Lever bottoming on Setting Pin with Pin fully seated. Setting Lever too long. This will keep Escapement Rod from being depressed far enough to release Escapement Pawl.



Check for Release Link bottoming and Point (A) not being depressed fully below upper side of Bottom Plate. (See Adj. 108)

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When installing New Escapement Pawls stone the surface of the Pawls that contact the Comb Teeth for better escapement action.

POWER SET ADJUSTMENTS

LATCH FOR MULT. KEYS

Ref. Par. 142, Page 41

POWER SET CAM THROWOUT LEVER

Ref. Par. 113, Page 35

Adjust Lever 'C' to position Power Set Cam 'A' for Fig. 2, but not to have Cam bottom on Clutch in Drive Shaft. Approximately .001 from bottoming when Power Set Lever #81655 is fully positioned down.

Fig. 1 will position after this adjustment is made.

POWER SET LEVERS; 1ST ADJUSTMENT

Ref. Par. 114, Page 36

To position parts for adjustments, place Selection in Unit. Depress Neg. Mult. Key. Rotate hand crank until Power Set Lever drops and Power Set Cam moves into position shown in sketch.

Purpose: If too wide the Power Set Cam will not place Gate into position fast enough which will allow the #1 & #2 Add-Sub. Gears to start rotating, if there are 9's in the 1st & 2nd Column, before they are in mesh.

POWER SET LEVERS; 2ND ADJUSTMENT

Ref. Par. 115, Page 36

With parts positioned as in above, continue to rotate crank until parts are positioned as shown for this adjustment. With Power Set Cam on high point of roller the Power Set Latch rubs on the square stud with pressure for the 75% bite.

Purpose: If clearance exists between stud and latch, the Gate will bounce on the revolution of the Power Set Cam.

ADD-SUB. GATE ACTUATING ARMS

Ref. Par. 116, Page 36

After depressing Mult. Keys as mentioned, lift Levers A & C manually to contact studs.

Purpose: Excessive clearance will cause Gate to be late in positioning as mentioned previously.

MULT. BAR LEVER

Ref. Par. 122, Page 37

This adjustment may be made or checked at the same time as the above is positioned.
To adjust: Latch Neg. Dey and pry up on Mult. Bar to obtain clearnace.

NEG. BAR LEVER

Ref. Par. 123, Page 37

This adjustment may be made or checked at same time as Par. 116 above.

To adjust: Latch Accum. Key and pry up on Neg. Bar to obtain clearance.

DISABLING LEVER; 1ST ADJUSTMENT

Ref. Par. 117, Page 36

Purpose: If there is less than 50% bite the Hook end of Delatch Lever may miss the square stud in its forward movement.

DISABLING LEVER

Par. 119, Page 37

Place Zeros in Unit. Lift up on Lever 'B' at arrow; move Power Set Levers Assembly to rear by pressing down on lower rear end where eccentric contacts (Par. 114)

POWER SET CAM SHIFT LEVER

Ref. Par. 120, Page 37

To check Fig. 2, Latch Mult. Key pull down on Horse Shoe Interlock to latch it in a downward position.

MINUS STOP

Ref. Rar. 121, Page 37

Purpose: To limit the downward travel of the Add-Sub. Gate to keep Add Add-Sub. Gears from contacting and Tripping Transfer Gears.

RESTORE LATCH CONTROL

Ref. Par. 124, Page 37

Note: If necessary to form at 'C' be sure to check Par. 118 (Link F Adjustment). Also if Link F in Par. 118 can't obtain the desired clearance as mentioned in Par. 118, then check Par. 124 and adjust at 'C'.

DISENGAGING SLIDE

Ref. Par. 125, Page 38

Purpose: If not enough throw of Latch 'C' the Power Set Lever may be sluggish in dropping thus causing under multiplication.

STABILIZER

Ref. Par. 128, Page 38

Stabilizer not to rub on Stud as it straddles the stud.

BUMPER

Ref. Par. 129, Page 39

STOP FOR POWER SET LATCH

Ref. Par. 130, Page 39

POWER SET LATCH RELEASE LEVERS (3 POINT JACK)

Ref. Par. 126, Page 38

Note: If you change this adjustment, check Par. 127, 2nd Part.

CLUTCH OPENING ADJUSTMENTS

MULT. KEY ONLY

Ref, Par. 141, Page 41

This is for the Individual Key. After making this adjustment, check Par. 24 & 36.

ACCUM. & NEG. KEYS

To control clutch releasing on these Two Keys, adjust by twisting arm of #61285, Page 64, where it contacts lower arm of #61275. (Sketch in parts and method of adjusting).

Note: After making this adjustment, Check Par. 24 & 36.

MULT. CORR. KEY LEVER

Ref. Par. 138, Page 40

If this lever is disturbed it will effect Par. 139.

CORR. KEY CLUTCH OPENER

Ref. Par. 139, Page 40

Two Parts: Eccentric 'C' is first; Stud F is second.

KEYBOARD CLEAR

Ref. Par. 140, Page 41

SHIFT SHAFT OSCILLATING LEVER

Ref. Par. 24, Page 18 (STW)

Also see Service Letter #182 or Par. SW Manual for additional adjustment.

(Note this adjustment should follow any clutch releasing adjustments.)

ADD PITMAN RELEASE

Ref. Par. 36, Page 20, STW

This adjustment would be effected by any clutch releasing adjustments.

Do not form at A as mentioned, form tail of lever contacted by roller of A.

MULT. KEYS RELEASE LEVER

Ref. Par. 143, Page 41

SERVICE LETTER #210

REPEAT MULT.

POSITION SELECTOR

Ref. Par. 134, Page 39

Note: This adjustment must be proper before Par 127 is made.

DELATCHING BAIL

Ref. Par. 135, Page 40

MULT. UNIT KEYS DISABLING LEVER

Ref. Par. 136, Page 40

RING LOCK BAIL

Ref. Par. 137, Page 40

INSTANT CARRIAGE RETURN

SHIFT CONTROL SHAFT

Ref. Par. 131, Page 39

RESTORE & ACTUATING ARMS

Ref. Par. 132

RESTORE LEVER

Ref. Par. 133

(NOTE: See Page 64A. This shows later Style Carriage Return (which is now obsolete) and the later Style Repeat Levers. See Note 1 & 2 at bottom of Page 64A.

Read over the pages 48 to 51 and check each problem with the machine to make sure you understand. If you do not or cannot reason why, then make a note and ask about it. Concentrate on this--just don't breeze over it. A lot of research and work was put into this for your benefit, so appreciate it.

Read over and check every Service Letter you have. Make notes on any you have questions on. These are for your use and designed to assist you.

Parts Identification Problems Issued

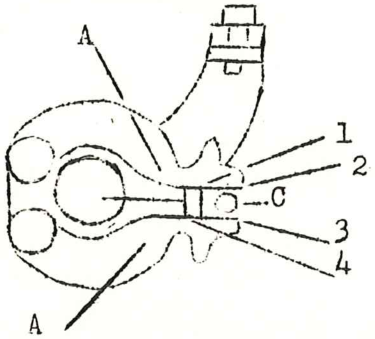
Service Problems Issued

FOUR POINT CONTACT (Gate Centralizer)

Two Style of Add and Subtract Gate Centralizer
Fig. 1 is obsolete Style, but still found on machines.
Fig. 2 is later and present Style.

Fig. 1

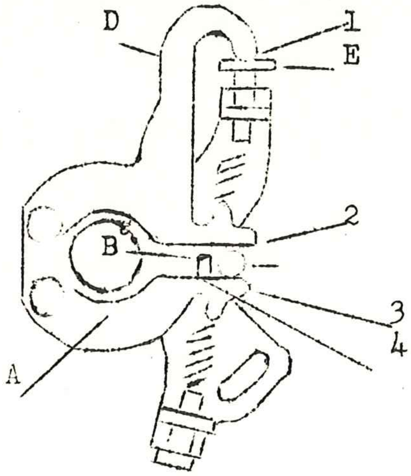
Adjust Arms (A) to contact Lip (B) and Stud (C) (Upper Arm contacts Lip and Stud at same time Lower Arm Contacts Lip and Stud.)



(Stud is same diameter as width of Lip)

Fig. 2

Lower Arm (A) contacts Lip (B) and Stud (C). Adjust Screw (E) to contact Arm (D) at Top and lower end contact Stud (C).

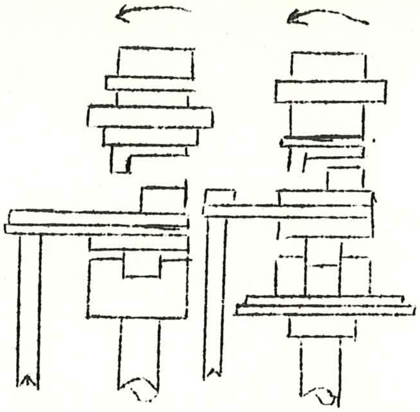


(Stud is larger than width of Lip (B)

Should you order an Add-Sub. Gate, be sure you obtain proper size Stud for proper type Centralizer.

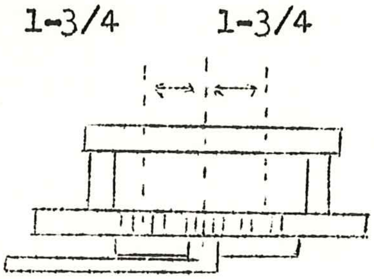
TWO POINT SHIFT GEAR TIMING

Fig. 1



Install Shift Gear Bearing Plate and check timing as follows:

Depress Right and Left Shift Keys to position Shift Drive Clutch, then observing that a valley of the Carriage Shift Gear teeth is in line with center of roller of the top Shift Gear Centralizer, rotate Carriage Shift Gear manually in reverse direction of rotation to bring lugs together. The Gear should back up more than one tooth but not more than two. (approximately 1-3/4 teeth) (Fig. 2)



Top View

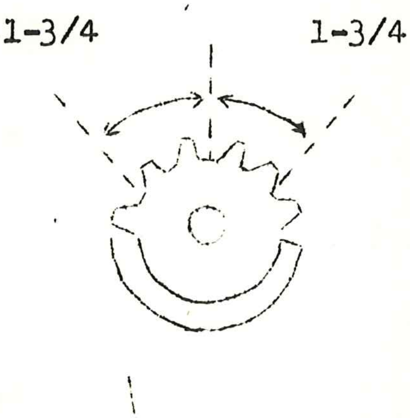


Fig. 2

Note: The timing is the same for all models except as noted in Friden Service Letter #43 in which the timing of the Right Shift Drive Gear ONLY is two full teeth to the Left, or direction of rotation on Model S, Series #100,000 to 104,999 only.

If trouble occurs in Carriage Shift check for worn parts, Shift Clutches and Drive Gears. Look for binds in Shift Clutch Push Rods and Yokes. Worn Studs on Main Shift Gear will cause excessive end play in Carriage. Check for proper meshing of Clutches and Drive Gears. Worn Studs on the Main Shift Gear will cause the Carriage to bounce when centralizing causing errors in Division.

To release a lock up on the Carriage Shift, release the Opersting Key that may be depressed and otherwise release parts that may be holding the Shift Clutch in gear with the Shift Drive Gear. Carriage will now be free but not centralized, being positioned between the Add and Subtract Gears. Restore the Machine to Home Position and the Carriage can now be centralized. (Do not try and turn the Drive Shaft by Hand Crank if the Add and Subtract Gears are in Mesh with the Dial Gears and the Shift is engaged.)

When replacing the Large Carriage Shift Gear, make certain that it has no binds. Rotate it manually and slowly let it centralize. It is sometimes necessary to make adjustment of the outboard bearing to free the Shift Gear.

Main Keyboard Adjustment - Gray Line Models

1. Place Keyboard in Machine; leave screws on side frame loose till after Keyboard has been adjusted.

2. Run Long Adjusting Screws into Carriage Support Bar till Rear of Keyboard is parallel with Front Bearing Plate and approximately .030 of Bearing Plate is showing above Keyboard rear plate. (This gives a starting point).

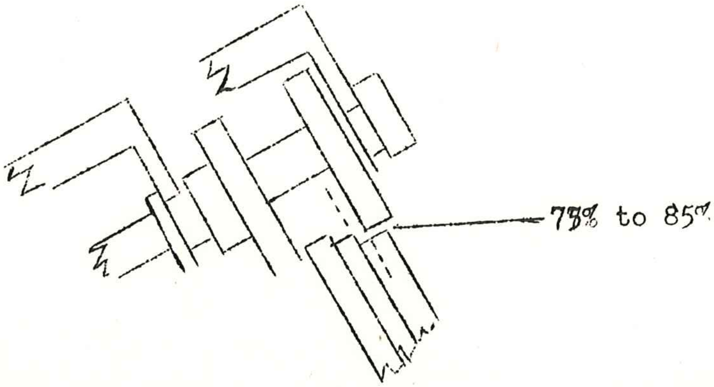
3. Secure nuts on rear of Long Screws against Rear of Keyboard. (This holds Keyboard steady.)

4. Depress all "1's" in Keyboard; Rotate Crank slowly and observe the contact of the Selection Gears to the Actuator Teeth. 75% to 85% bite.

5. Move Keyboard up or down by long screws (Turning these from the front end, loosen the rear nuts if necessary slightly to allow Screws to turn, then secure nuts again) to obtain a 75% to 85% bite of Selection Gears to Actuator Teeth.

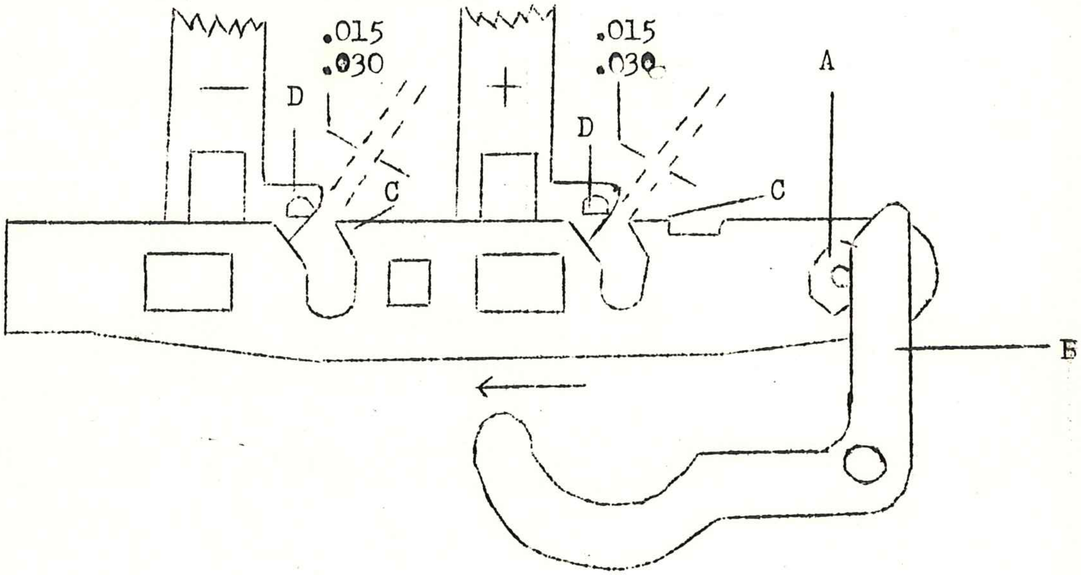
   Keep Keyboard Leval. If one side is low or high, adjust that side accordingly. If entire Keyboard needs to be moved and is level, turn each rod the same amount. To observe correct bite of teeth, look straight down on the lower Selection Gear Teeth and on the upper Gears. Observe from left to see how much the Actuator teeth are meshing with the Selection Gears.

6. After adjusting, check other rows of keys then secure screws in side frames.



CLUTCH RELEASE SLIDE ADJUSTMENT - Pull Type Division Only

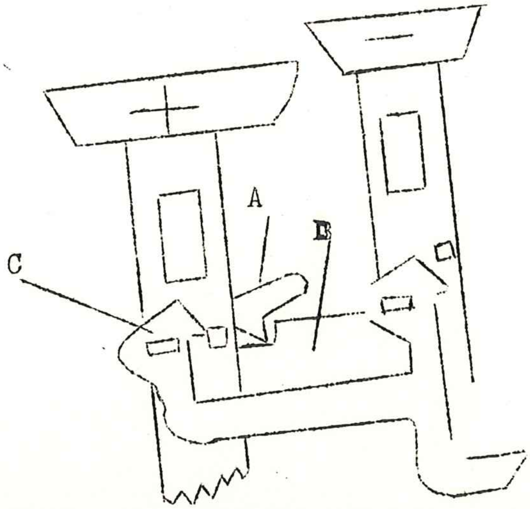
Adjust by moving Screw Stud (A) against Division Pitman (B) and moving Clutch Release Slide to rear to position Locking Prongs (C) for .015--.030 clearance to Half Round Stud(D) on Plus and Minus Keys.



FULL CYCLE LOCK PAWLS ADJUSTMENT

Pawls (A) to drop into notch on Directional Contol Slide (B) just before Plus and Minus Keys latch on Key Latch (C). Fig. 1.

(Found on Contact Blade Models; Not Micro-Switch)



Same action on Minus Key

Fig. 1

FULL CYCLE PAWLS (Continued)

If dropping in late, shorten Pawl. Engage Pawl ONLY in notch. DO NOT have Keys depressed, and tap on end of Directional Control Slide. Fig. 2.

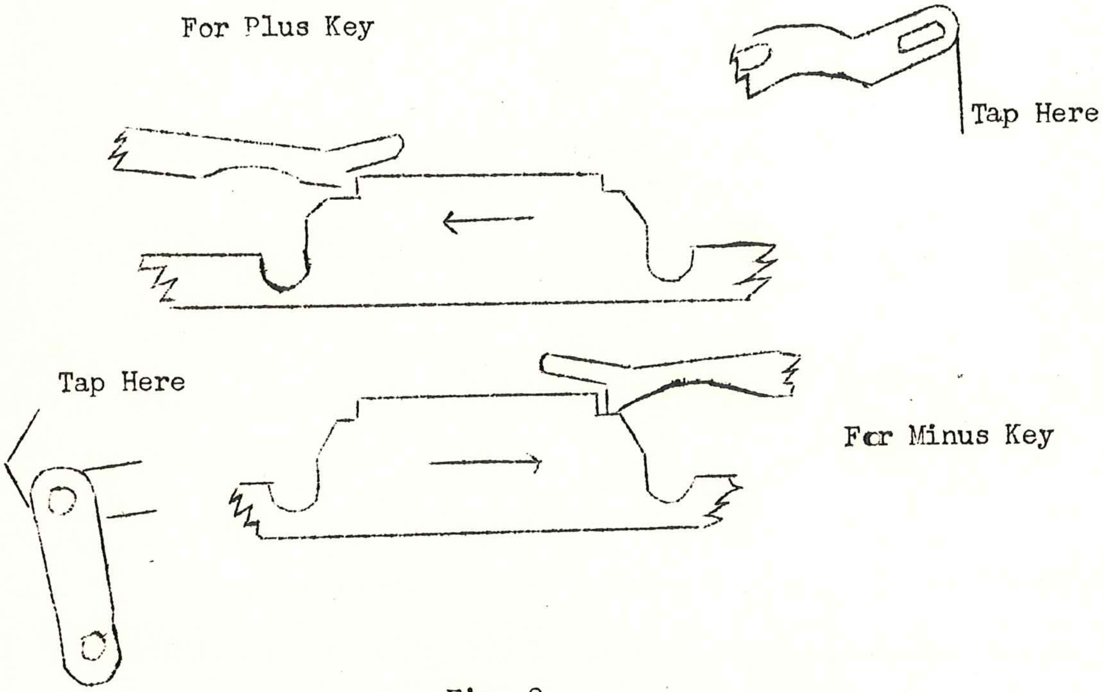


Fig. 2

If dropping in early, lenghen Pawl. Keys and Slide in normal position. Tap on top of Pawls. Fig. 3.

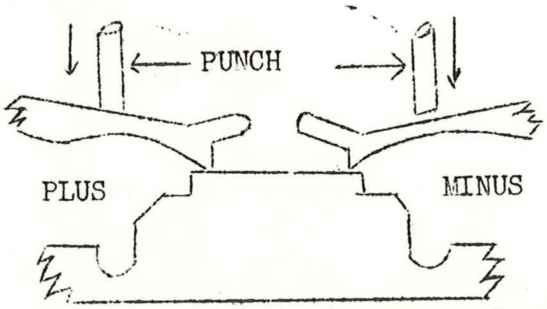


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Fig. 3

FULL CYCLE PAWLS (Continued)

As a check, wieh Pawls engaged only in Notch, the Full Cycle Lock Pin should clear Full Cycle Disc. (Fig. 4)

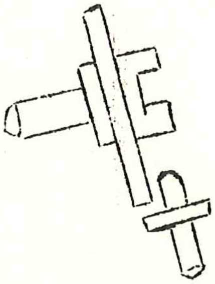
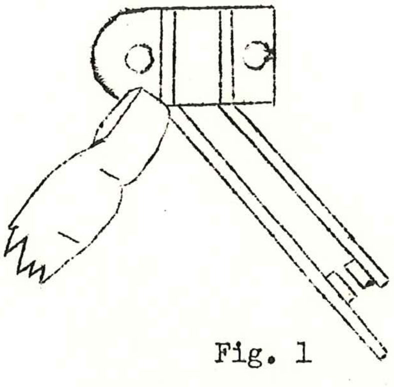


Fig. 4

SWITCH BLADE ADJUSTMENT

Adjust Switch Blades so on a slow depression of Plus Key the Motor will start safely ahead of the Clutch releasing.

(a) To close up and add tension to Rear Blade, form Blade as shown in Fig. 1. Do not form in center of Blade or tension will be destroyed.



Front →

(Continued on Next Page)

Fig. 1

SWITCH BLADES (Continued)

(b) To open up if too close, form Rear Blade at bottom at sharp angle to Contact Point as shown in Fig. 2.

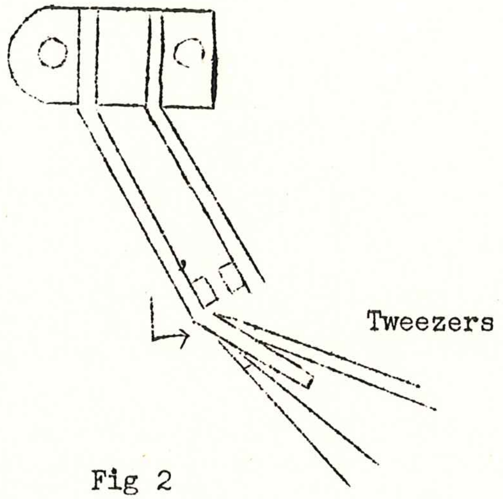


Fig 2

(NOTE: Before installing new Blades, it is necessary to form Blades toward front of machine for tension. Use spare Contact Block or pliers.)

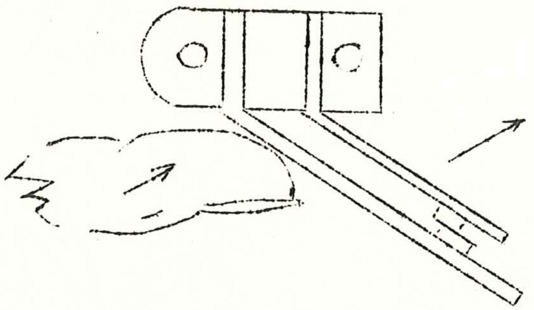
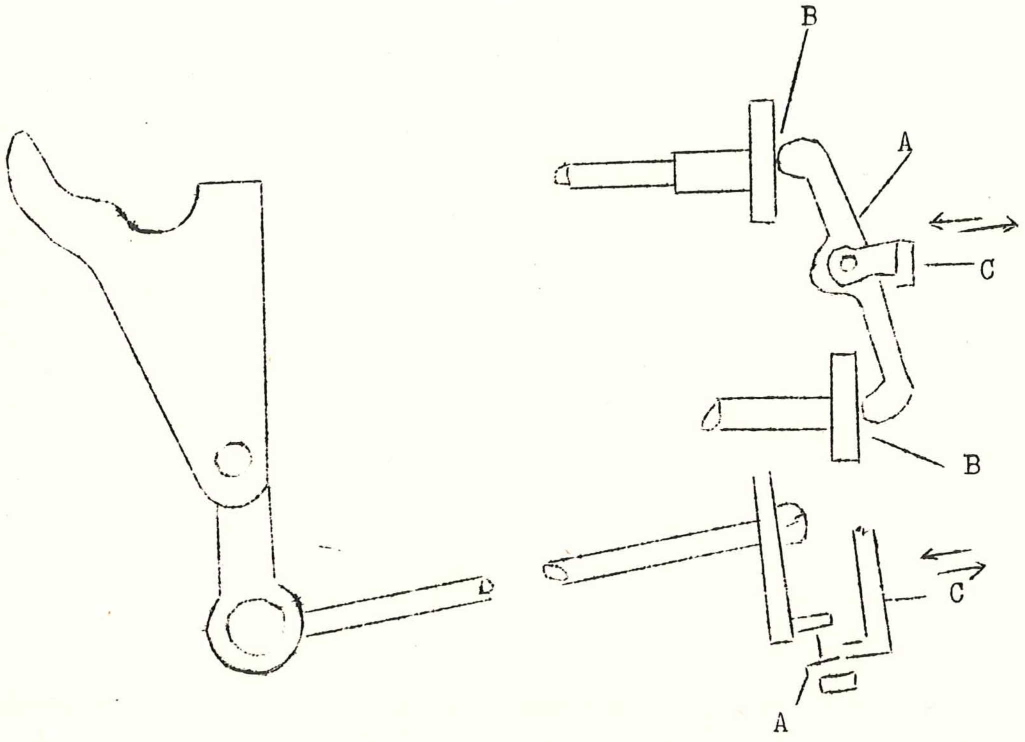


Fig. 3

SHIFT INTERLOCK LEVER (WALKING BEAM INTERLOCK)

Depress and HOLD down Right Shift Key. Walking Beam (A) to contact Right and Left Shift Forks without pressure and without clearance at (B). Adjust at (C).



LEFT SHIFT AND RETURN CLEAR ENGAGING LEVERS

(a) Left Shift Engaging Lever
Return Clear Key Latched down. Adjust Left Shift Engaging Lever (A) at eccentric (B) to position Left Shift Fork (C) against Walking Beam (D) Fig. 1. But NOT to have Push Rod (E) extend through Left Shift Fork (C) as in Fig. 2, Page 87.

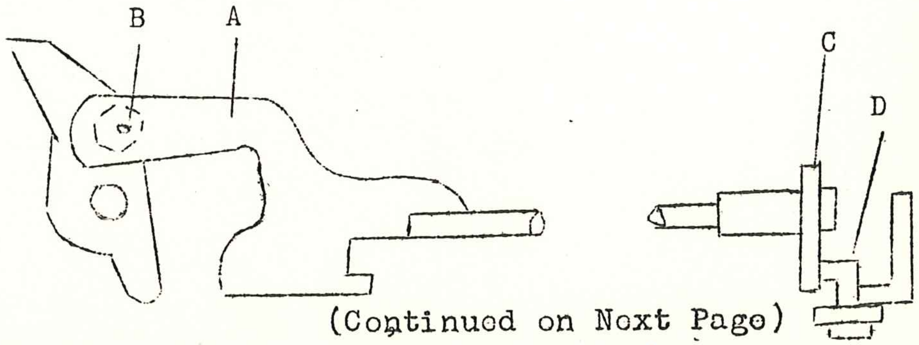


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Fig. 1

Left Shift Engaging Lever Adjustment (Continued)

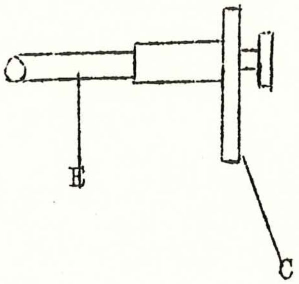
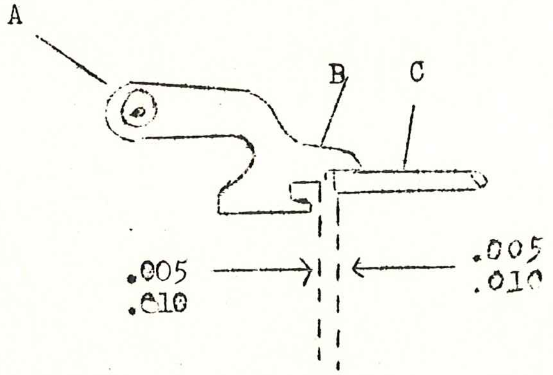


Fig. 2

(b) Return Clear Engaging Lever:

Adjust Eccentric (A) on Return Clear Engaging Lever (B) in normal pOsition for .005--.010 between Push Rod (C) and Lever (B).

To Check: Push the Left Shift Engaging Lever and Return Clear Engaging Lever to the rear and upward over the Push Rod and Stud. Slwo ly let both Levers restore onto its stud slightly before Return Clear Lever Drops onto Push Rod. Adjust Eccentric (A) on Return Clear Lever if necessary.



TO TIME:

Install Assembly. Notice the Punch Mark on Gear of #6 Actuator is in line with a Tooth and this Tooth is in line with the Center of Hole for Screw of Shift Shaft Bracket in Front Bearing Plate. Fig. 1. Revolve Drive Shaft till the Punch Mark is Two Tooth (Two valleys or three tooth points) from reaching Home Position. Fig. 2.

Place Point of Shift Pawl (A) as far receded in race way and in Center of Shaft (Fig. 3.) Mesh Gear of Shaft with Actuator Gear and Secure Bracket. Turn Drive to Home position. Shift Pawl when in proper time is shown in Fig. 4.

When properly timed the Shift Pawl will be positioned Two Tooth to left of Shaft.

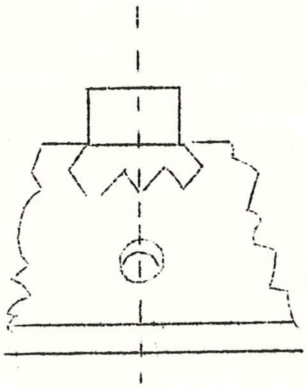


Fig. 1

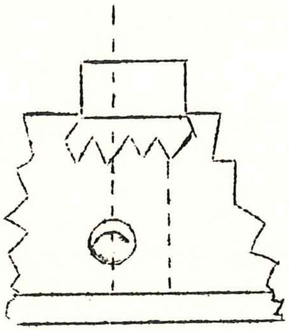


Fig. 2

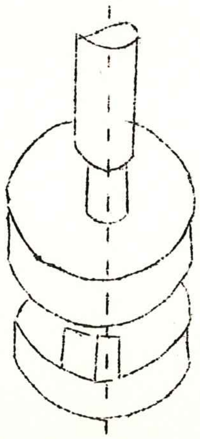
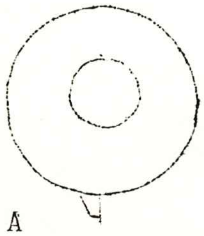


Fig. 3



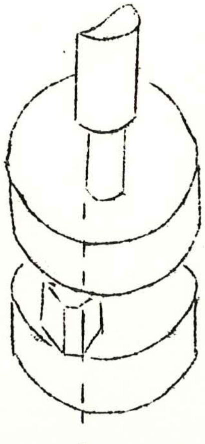


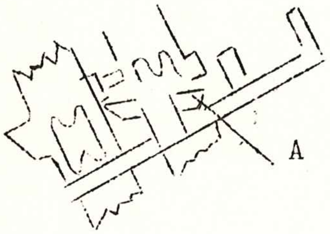
Fig. 4

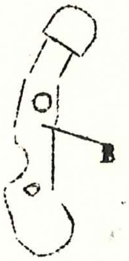
MULTIPLIER CORRECTION: LEFT SHIFT DISABLING ADJUSTMENT

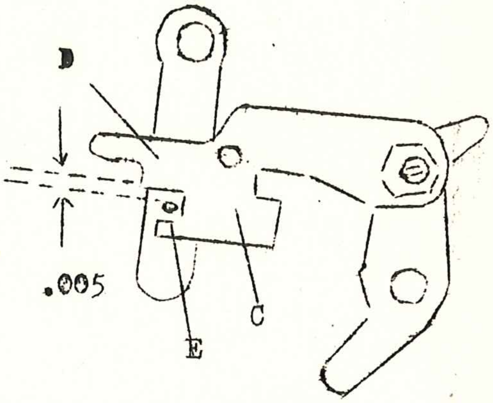
To reduce the possibility of the Multiplier Key latching and machine cycling upon the simultaneous depression of the multiplier Key and Multiplier Correction Key.

Adjustment for machines with Walking Beam type Interlock (A) and without Key Release Lever (B).

Depress Multiplier Correction Key. Form Stud (C) for .005 clearance of Lever (D) to Stud (E).







FEED PAWL AND DISABLING LEVER ADJUSTMENT

Holding Pawl (A) parallel with Side frame. Set Left Side of Feed Pawl (B) in line with Left Side of Latching face of Holding Pawl (A) (Fig. 1). Align all Segments straight and equally spaced at top.
Make one Selection in Unit. Depress Disabling Lever (C) manually; Depress Zero Key, Unit will escape and Segment (D) will move against Lever (C) (Fig. 2). Adjust Lever (C) right or Left to position left side of Segment (E) to left side of Pawl (B) (Fig. 3).

Depress Multiplier Key and Segment (E) should Feed out. Make this check in all positions. Adjust accordingly.

Fig. 1

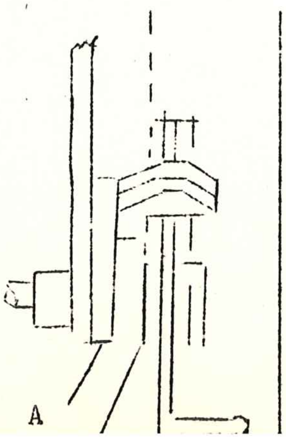


Fig. 2

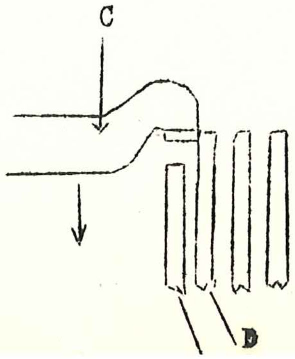
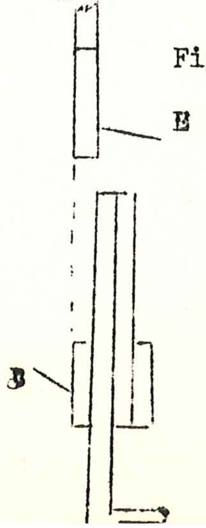


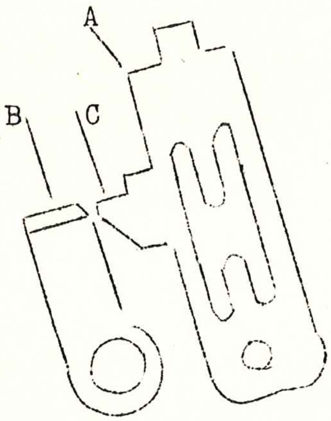
Fig. 3

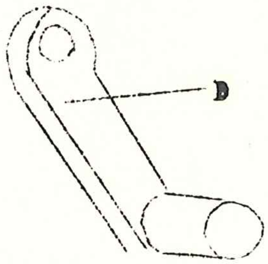


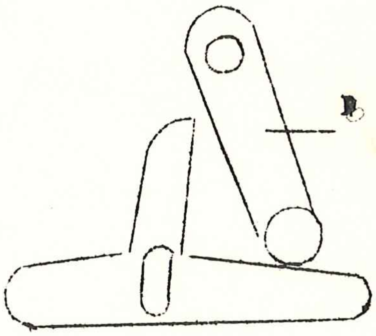
CLUTCH RELEASING ON MULTIPLIER KEY

To keep Key from Latching and Machine Cycling on Slow depression of Key:

Depress Multiplier Key (A) slowly; Main Clutch to release just before Key Latch (B) latches on Key Latch Point (C). Adjust at Lever (D) by forming or if an Eccentric, adjust Eccentric.



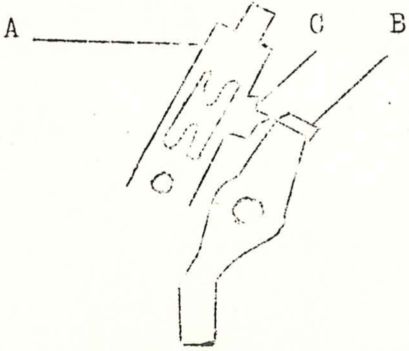


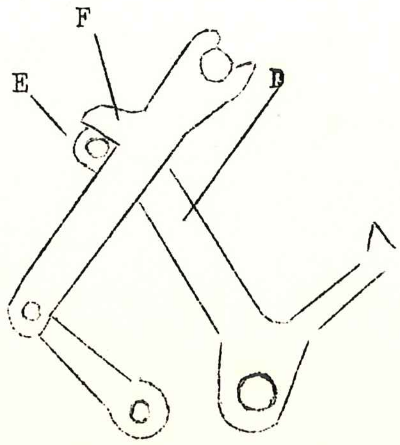


CLUTCH RELEASING ON ACCUMULATIVE AND NEGATIVE KEYS

To keep Keys from Latching and Machine cycling on Slow depressing of Keys:

Depress Accumulative and Negative Mult. Keys (A) slowly; Main Clutch should release just before Key Latch (B) latches on Key Latch Point (C). Adjust by forming Lever (D), to move Roller (E) away from Lever (F).

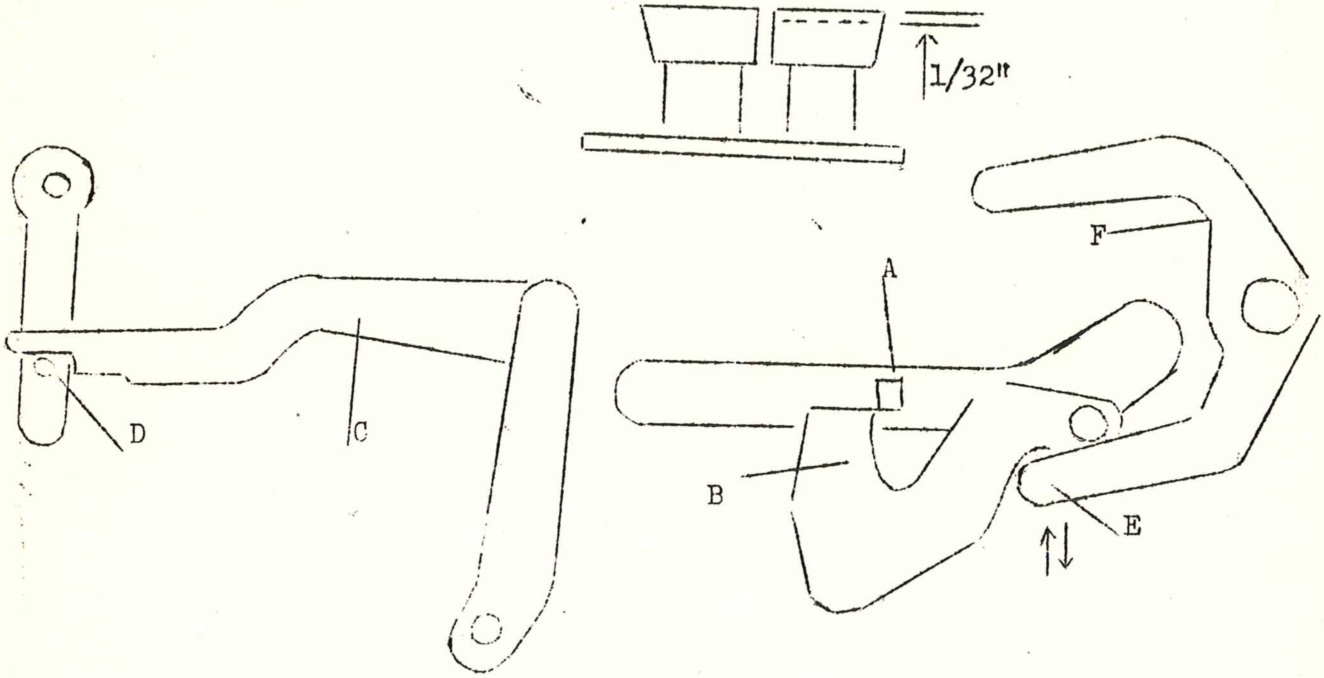




LEFT SHIFT ENGAGING LEVERS RESTORE ADJUSTMENT

To keep Accumulative and Negative Keys from latching and Machine cycling on a partial release of Keys and re-depression.

(a) Accumulative and Negative Keys
Unit in First (Home) position. Depress Accumulative and Negative Mult. Keys; hold down, then slowly release. Square Stud (A) should remain on Top of Relatch Lever (B) till Keys are 1/32" or less of top travel. Before Square Stud (A) drops off, the Left Shift Engaging Lever (C) should be restored on Stud (D). Adjust lower Arm (E) of Interlock (F) for action of Square Stud (A). It may be necessary to twist Arm of Stud (D) to the rear slightly if adjustment of Arm (E) does not work. Stud (A) must be off Relatch Lever (B) before Key reaches Home Position.



(b) Multiplier Key
Depress Multiplier Key and hold down; slowly release the Key. Square Stud (A) should remain on top of Relatch Lever (B) till Key is 1/32" from top travel. Before Square Stud (A) drops off, Left Shift Engaging Lever (C) should restore on Stud (D). Adjust lower Arm (E) of Interlock (F) for action of Square Stud (A).

Check thrust of Left Shift Push Rod per adjustment, Page #84-85. If Rod extends through Fork, adjust eccentric per 84 before adjusting Arm (E).

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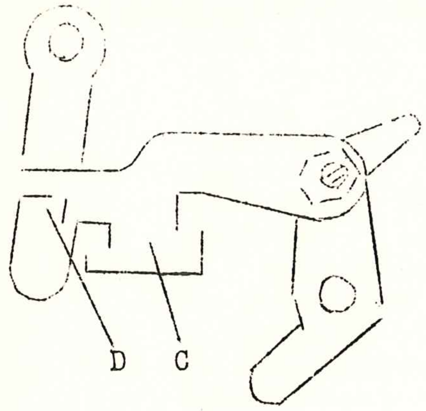
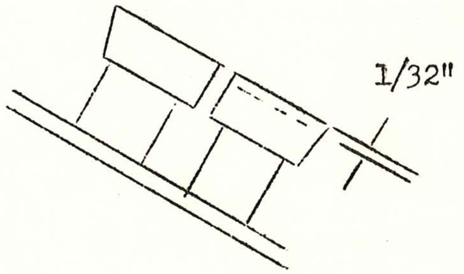
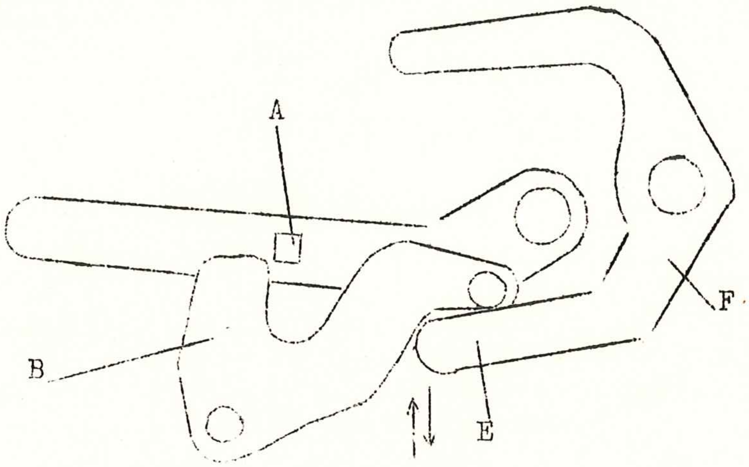




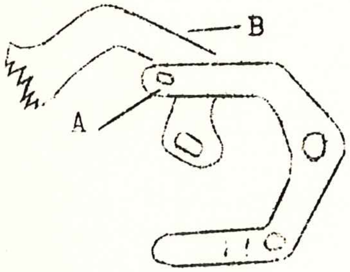


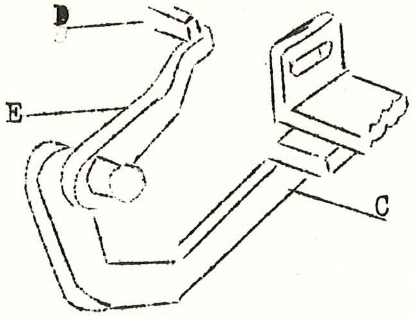
The adjustments listed above are to eliminate the possibility of the Multiplier Keys, on machines without the Key Release Lever, from latching and the machine cycling.

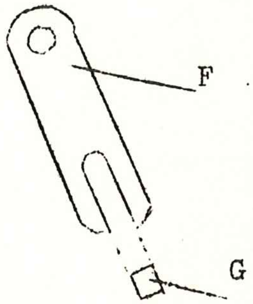
* * * * * * * * * * * * * * * *

INTERLOCK LEVERS

Roller (A) against Negative and Accumulative Multiplier Bars (B) and Lever (C) against Multiplier Corrective Lever and Lip (D) of Multiplier Key against Lever (E), the Multiplier Key Interlock (F) to straddle Square Stud (G) when depressed. Form Levers if Necessary.



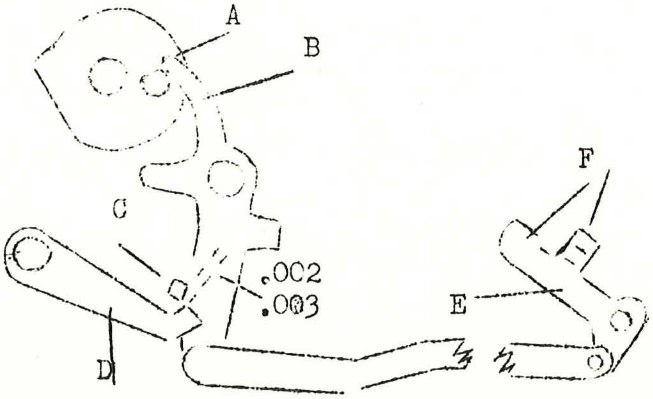




MULTIPLIER SETTING RESTORE LEVER

Machine in Multiplication operation with High Point of Roller (A) on Lever (B); latching Point (C) should overlatch (D) with .002--.003. Adjust by forming Lever (B).

With Lever (B) latched on Latch (D) the Restore Lever (E) will be snug but not binding against Setting Levers Form Lips (F).



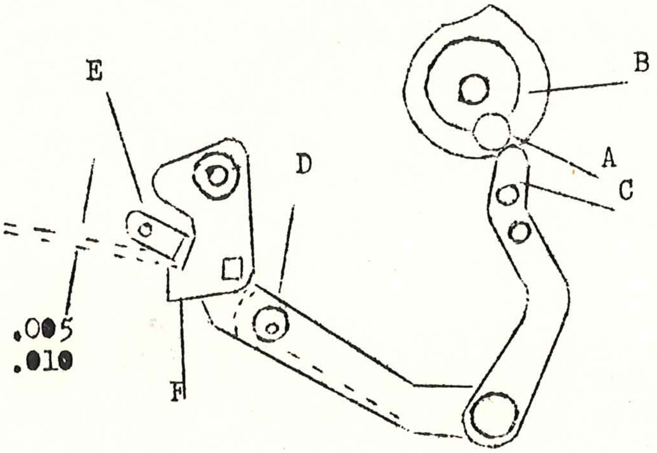
REPLACING CARRIAGE SHIFT SHAFT ASSEMBLY - ST

Install carriage Shift and associated parts.
Whenever a Carriage Shift Shaft Assembly is damaged and has to be replaced all new parts are used.

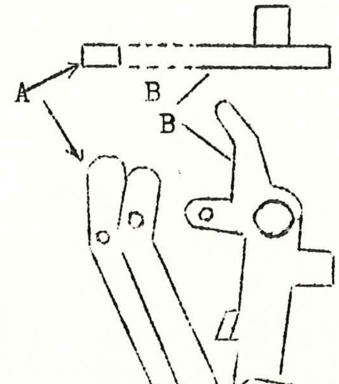
The following is the method of setting a Carriage Shift Shaft properly in sequence.

1. POWER SET LATCH RELEASE LEVER (3-Point Jack)

With Roller (A) of Power Set Cam (B) on high Point of Relatch lever (C). Adjust Eccentric (D) for .005--.010 overlatch of Lever (E) to Latch (F).



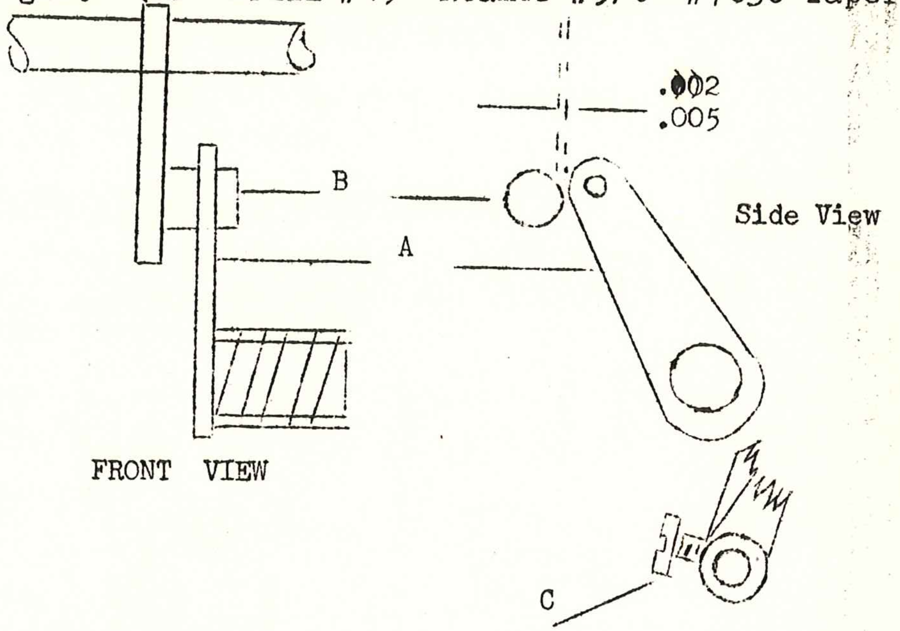
2. Position Shift Shaft to the Right as far as possible. Position "3-Point Jack" for Delatch Lever (A) to be in line with Lever (B). Snug up Screw (C) slightly.



(Shift Shaft Continued)

3. CARRIAGE SHIFT THROWOUT

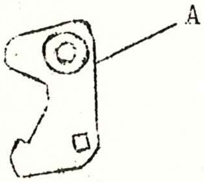
Escape Unit past 2nd position. Adjust Throwout Lever (A) to Stud (B) for .002--.005 clearance by rotating shaft. After adjustment is made, secure Screw (C), on "3-Point Jack" hub tight. (Use Drill #49--Reamer #5/0--#7030 Taper Pin.

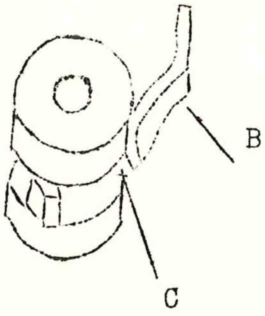


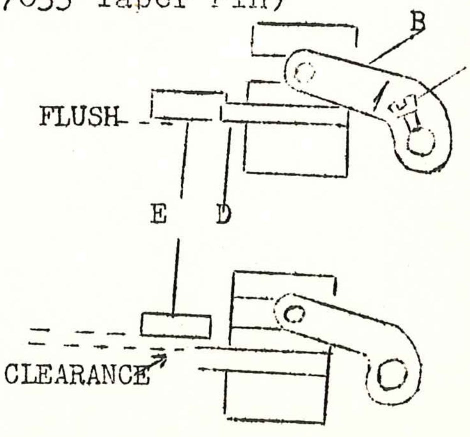
4. SHIFT CLUTCH OPERATING LEVER

Trip off Latch (A) manually, allow "3-Point Jack" to trip SLOWLY. Position Clutch Operating Lever (B) straight and against Drum at (C). (Hold Shift Shaft to right at same time.) Raise Clutch Operating Lever (B) so underside of Shift Tooth (D) is flush with underside of Shift Rack (E). Secure Screw (F).

Relatch "3-Point Jack". Depress Mult. Corr. Key and press down on Shift Rack (E) while rotating Drive Shaft to check Shift Tooth missing Shift Rack.
(Use Drill #52--Reamer #6/0--#7033 Taper Pin)

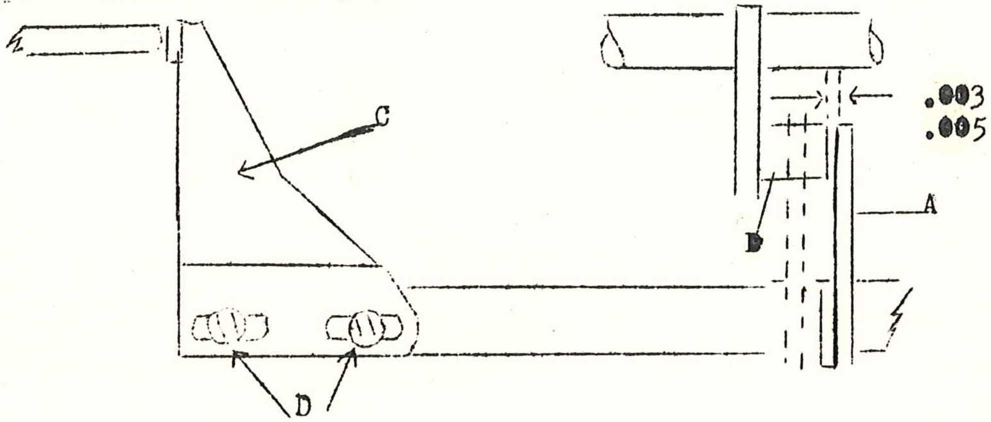






5. SHIFT DISABLING BRACKET

One escapement of Unit from Home Position, Arm (A) to clear Stud (B) .003--.005. Adjust Bracket (C) at Screws (D). More than one escapement, Arm (A) to position on Stud (B).



CAUTION: Never change Adjustme nt #1 unless absolutely necessary, or that you give the other adjustments a good check. #1 adjustment controls the position of the Shaft to which the others are made .

TRACING OPERATIONS
(FOUR-POINT SHIFT)

1. (a) How are heavy Centralizers #75030 and #75035 operated? Page 25, (FT)

   (b) What are their functions?

2. How is #75030 latched when machine is shifting? Page 25, (FT)

3. (a) What is the function of #75040 and #75045? Page 25, (FT)

   (b) How are they operated?

4. How is #75032 delatched when Shift Gear centralizers? Pg. 25, (FT)

5. How is Cross or Dividend Tabulator Key released when Carriage reaches last position to Right? PG. 29, 25, 5, (FT)

6. What is the purpose of #75085 and #75090? PG. 23 (FT)

7. What is the purpose of #75140 and how does it operate? Page 25, (FT)

8. What is the purpose of #75173 and #75172? Pg. 7, (FT) (Upper Right Sketch)

9. What is the purpose of #94230? Pg. 8, (FT) (Top, Rear of Frame)

FOUR-POINT SHIFT

The Four-Point Shift mechanism is found on the Grey Model "C" are "D" machines and on the early STW's. It is a mechanism to allow for a smooth action of the Carriage as it shifts across the machine.

Tracing Operations (Issued)

After the Tracing Operations, disassemble and check parts and reassemble.

Timing: Place the two idler Gears in position, place Shift Gear in place with two centralizing Detents Horizontal, install Shift Gear Bearing plate upside down to hold Shift Gear in place (or use a short shaft of suitable diameter). Next install Shift Drive Gears, Right and Left, timing them one full tooth in direction of Rotation (Same timing as Two-Point Shift.) Now install Lower Bearing Plate, Centralizers, scissors, etc., and carefully swing Upper Bearing Plate around and into position, secure and check the timing of the Gears.

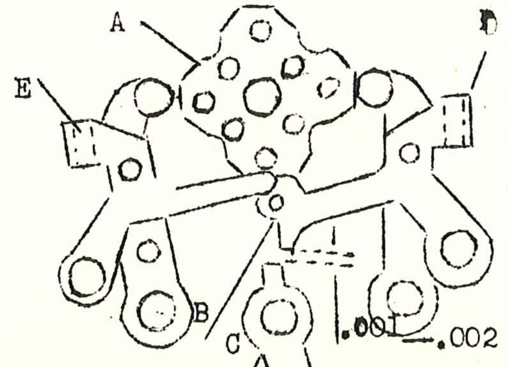
To Check Timing: Test the same as you do on the Two-Point Shift, by engaging the Shifts and backing the Large Shift Gear in the opposite direction it rotates. (In place of the Shift Gear backing up 1-3/4 teeth as in the Two-Point it will back up 3/4's of a tooth.)

(Note: The later Right and Left Shift Gears have a Punch Mark for timing and the Bearing Plate has a Punch Mark for lining the two.)

ADJUSTMENTS

1. FOUR-POINT SHIFT CENTRALIZER UNIT

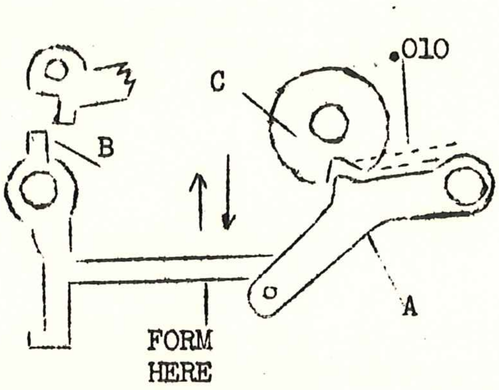
When Shift Gear (A) is on High Point as shown, Centralizer (B) to overlatch on Latch (C), .001--.002.



Adjust by forming the Ears (D) and (E) of Centralizers and keeping adjustment even to prevent unnecessary bumping.

2. SHIFT CENTRALIZER CONTROL LEVER

On a slow release by hand, Lever (A) should release Latch (B) when Lever (A) is approximately .010 from bottom of Notch in Cam (C). Form arm of Latch (B).



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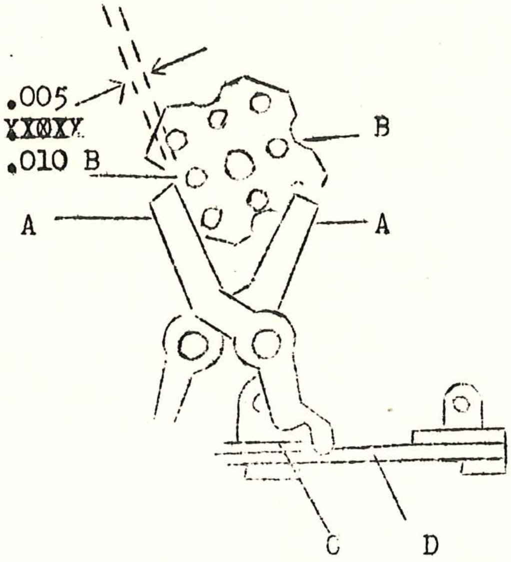
3. SHIFT LOCKS (Scissors)

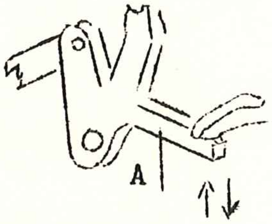
Upper ends of Shift Locks (A) should clear Studs (B) on Shift Gear .005--.010 in Right and Left Shift. Adjust by forming Lip (C) on Actuating Lever (D).



4. TABULATOR KEY RELEASE LEVER

With no Tab. Stop depressed, Dividend Tab Key should release on first override action when Carriage reaches Last position. If key fails to release, adjust Lever (A) upward.

On "D" Models (Cross Tabulation), Lever (A) is adjusted so the Keyboard will not clear when the Add Key is down and the Carriage reaches Last Position. Form Lever (A) down to delay the releasing of the Cross Tab. Key till the Keyboard Clear Link has moved under the Clear Gate in its rearward motion.



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5. LATCH RELEASE BAILS

1. Shift Gear half turned. Upper end of Lever (A) to be centered to Flat edge of Latch (B) or near beginning of knife edge of Latch. Adjust by forming Lever (C) at (D). Fig. 1.

2. Machine in normal position. Lever (A) to clear knife edge of Latch (B) .025. Push Lever (A) forward to check. Adjust by having Lever (C) against Lever (D) and move Lever (A) to position clearance, then position Lever (E) against (F) to remove end play of assembly, but to have it free. (Fig. 2)
3. Parts in normal position, form Bail (A) to have .010--.025 clearance to Roller (B) and arm (C). Take care not to disturb other adjustments. (Fig. 3)

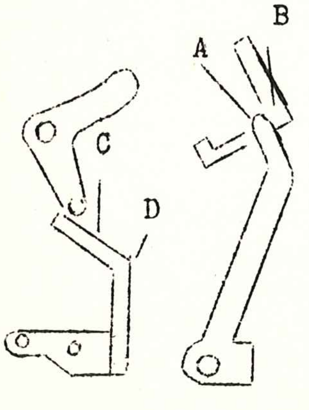


Fig. 1

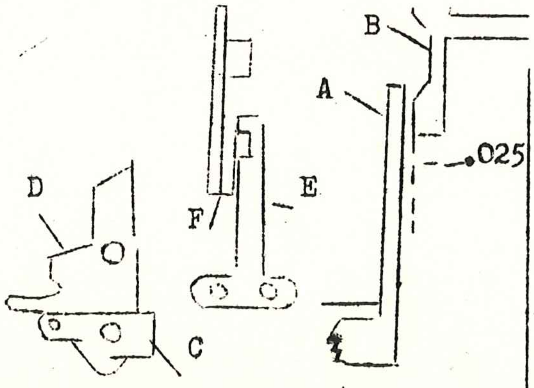


Fig. 2

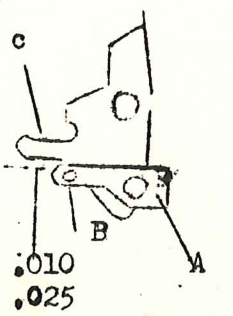


Fig. 3

MICRO-SWITCH AND FULL CYCLE CONTROL

Using the "C" Model Machine, check over the difference in design of parts for Clutch Releasing and Motor Starting, ect., compared to the Contact Blade type machine.

The Motor for the Micro-Switch machine has shorter wires than the Motor for the Contact Blade machine. Remember this should you order Motors for replacement. The Long Wired Motor could be used in a Micro-Switch Machine, but the Short Wired Motor could not be used in a Contact Blade Machine.

The Main Clutch assemblies for the Micro-Switch and Contact Blade machines are not interchangeable/ The Micro-Switch Clutch number is #50115 and the Contact Blade Clutch is #50025.

You will observe there are no full Cycle Lock Pawls on the Micro-Switch Models, and the Plus and Minus Key Latch has been removed.

Check the machine and determine what takes the place of the Full Cycle Lock Pawls and the Key Latch.

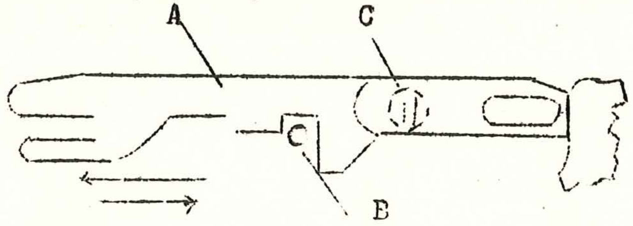
You will also observe that once the Division Keys have been depressed, they cannot be redepressed while the machine is dividing.

Observe why this happens and the reason the Division Keys cannot be redepressed.

ADJUSTMENTS

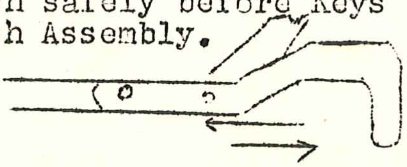
CLUTCH RELEASE LATCH-FRONT SECTION

Carriage in First position, Depress and hold Return Clear Key, then slowly release the Key. Lever (A) to restore on Stud (B) freely. Adjust Lever (A) front or rear by Screw (C).



CLUTCH RELEASING

On Multiplier, Return Clear, Dividend Tab, Keys. Lever (A) adjusted to release Clutch safely before Keys Latch without a chattering at the Clutch Assembly.



FRIDEN TOOL LIST

SS	8 -	10" H.J.J. Screw Driver	$1.25	
	9 -	8" H.J.J. Screw Driver	1.25	
	10 -	Spec. Set Screw Wrench for 2181 screw	.75	
	11 -	No. 52 Extension Drill	.60	
	12 -	No. 6/0 Extension Reames	3.00	
	13 -	No. 48 Extension Drill	.60	
	14 -	No. 5/0 Extension Reames	3.00	
	16 -	T forming tool - short	1.00	
	17 -	T forming tool - medimum	1.30	
	18 -	T forming tool - long	1.40	
2	-19 -	Forming tool used on 64580	3.00	(6.00)
	22 -	¼" spintite socket wrench	.50	
2	-23 -	8" Long starrett punch	.50	(1.00)
	27 -	Flat ball pusher	.75	
	28 -	Straight ball pusher (.093)	.75	
	29 -	Straight ball pusher (.125)	.75	
	43 -	Mechanics hand crank	1.00	
	48 -	Forming tool for 41135 boil	1.50	
2	-49 -	Jeweler's tweezers	.50	(1.00)
	50 -	Phillips screw driver, size #1	.45	
	51 -	Spec. Set screw wrench, 2194 screw	.75	
2	-54 -	½" x ¼" open end wrench	.35	(.70)
	55 -	Spec wrench for 30171	.35	
	56 -	Forming tool for 91602 boil	1.50	
	57 -	Trial key for full Capacity cary over	.40	
	59 -	5/64" Allen set screw wrench for 2184 set screws	.15	
	60 -	Selection lever adjusting tool	2.00	
	61 -	Forming tool for Counter Jacking finger	3.00	
	62 -	1/16" Allen set screw wrench for 2194 screw	.15	
	63 -	.050 Allen set screw wrench for 2181 screw	.15	

FRIDEN PARTS PRICE LIST

PART NO.	PART NAME	AMT.	UNIT PRICE	EXT.
1001	Spring	24	.05	1.20
1006	"	24	.07	1.68
1010	"	24	.06	1.44
1011	"	24	.06	1.44
1012	"	24	.06	1.44
1013	"	24	.03	.72
1014	"	24	.05	1.20
1015	"	24	.05	1.20
1016	"	24	.03	.72
1017	"	24	.09	2.16
1018	"	24	.03	.72
1023	"	24	.05	1.20
1024	"	24	.05	1.20
1025	"	24	.11	2.64
1034	"	24	.05	1.20
1039	"	24	.05	1.20
1040	"	24	.06	1.44
1048	"	24	.05	1.20
1058	"	24	.06	1.44
1072	"	48	.07	3.36
1092	"	24	.06	1.44
1094	"	24	.07	1.68
1100	"	24	.09	2.16

FRIDEN PARTS PRICE LIST

PART NO.	PART NAME	AMT.	UNIT PRICE	EXT.
1101	Spring	24	.07	1.68
1121	Spring	24	.03	.72
2013	2-56-Special Flat Head Screw	6 doz.	.06 doz.	.36
2020	4-48 x 3/16 Fillister Head Screw	6 doz.	.06 doz.	.36
2059	6-32 x 9/32 Special Screw	24	.02	.48
2085	10-32 x 1/8 Headless Set Screw	24	.03	.72
2106	Special Screw	24	.02	.48
2108	Special Screw	48	.02	.96
2114	4-48 x .130 Fillister Head Screw	48	.02	.96
2181	4-48 x 1/8 Set Screw	24	.06	1.44
2194	6-40 x 1/8 Set Screw	24	.06	1.44
2202	6-40 x 5/8 Fillister Head Screw	12	.14	1.68
2219	Special Screw	24	.02	48
2222	Special Screw	24	.05	1.20
2224	Special Screw	24	.06	1.44
2242	4-36 x 1/4 Oval Head Phillips Screw	6 doz.	.12 doz.	.72
2248	Special Screw	24	.05	1.20
3026	10-32 Special Hex Nut	24	.05	1.20
4000	Snap Washer for .093 Diameter Stud	12 doz.	.06	.72
4001	Snap Washer for .125 Diameter Stud	12 doz.	.06	.72
4003	#3 Lock Washer	12 doz.	.06	.72
4004	#4 Lock Washer	6 doz.	.06	.36
4005	#4 Special Lock Washer	12 doz.	.06	.72
4006	#6 Lock Washer	12 doz.	.06	.72
4007	#5 Special Lock Washer	12	.06	.72
4008	#8 Lock Washer	12	.06	.72
4009	#6 Lock Washer	12 doz.	.06	.72
4013	Washer	6 doz.	.06	.36
4019	Snap Washer for .143 Diameter Stud	12 doz.	.06	.72
4033	Washer	24	.02	.48
4060	Spring Clip	12 doz.	.06	.72
4061	Spring Clip	12 doz.	.06	.72
4062	Spring Clip	12 doz.	.06	.72
4129	Snap Washer	12 doz.	.06	.72
4131	Snap Washer	12 doz.	.06	.72
4194	Spacer	12	.05	.60
4204	Washer	12	.06	.72
7030	5/0 x 5/8 Taper Pin	100	.02	2.00
7031	5/0 x 1/2 Taper Pin	100	.02	2.00
7033	6/0 x 1/2 Taper Pin	100	.02	2.00
10008	Resistor for Govenor-115 volt	12	.88	10.56
10038	Motor Governor - A.C. - D.C.	2	4.12	10.56
10050	Lead Wire Assem. Bly	24	.20	4.80

FRIDEN PARTS PRICE LIST (Continued)

PART NO.	PART NAME	AMT.	UNIT PRICE	EXT.
10060	Capacitor	12	1.40	16.80
10123	Special Nut	24	.06	1.44
10371	Motor Brush	12	.24	2.88
10379	Governor Brush	12	.24	2.88
11344	Front Top Cover Bracket Rear	12	.60	7.20
20095	Counter Oscillator Arm Assembly	6	1.10	6.60
21024	Micro-Switch	3	2.00	6.00
24520	Return Clear Key Delatching Lever Assembly	24	.18	4.32
30043	Brace for Rear Bearing Plate	12	.14	1.68
30063	Carriage Retainer -- Rear	24	.09	2.16
30110	Spring Transfer Lever Assembly -- Right	12	.82	9.84
30120	Spring Transfer Lever Assembly -- Left	12	.66	7.92
30166	Bearing for Adjusting Actuators	12	.24	2.88
30167	Plate for Adjustable Actuator Bearing	12	.18	2.16
30171	Bearing for Adjusting Actuators	12	.12	1.44
30172	Plate for Adjustable Actuator Bearing	12	.18	2.16
30173	Detent for Actuator Bearing	12	.06	.72
31002	Shaft for Selection Levers	12	.06	.72
31570	Carriage Support Bar Assem.	6	2.72	16.32
31575	Tabulator Actuator Lever Assem.	12	.42	5.04
34061	Retainer for Add-Subtract Gears Detent Springs	12	.20	2.40
34064	Carriage Retainer -- Left Rear	24	.09	2.16
41155	Counter Block Out Disabling Arm Assem	12	.22	2.64
41160	Counter Blockout Bellcrank & Link Assem.	12	.24	2.88
41178	Division Throwout Bail	12	.16	1.92
41179	Division Throwout Acuator	12	.14	1.68
41550	Counter Carrier Assembly 8 Bank	4	5.20	20.80
41555	Counter Carrier Sub Assembly	3	1.32	3.96
41560	Counter Rocket Lever Assem.	6	.60	3.60
44530	#2 to #11 Counter Transfer Lever Assem.	48	.22	10.56
50007	5/32 Ball for Slip Clutch	6 doz.	.06	.36
50010	Motor Pinion & Shaft Assem.	6	.99	6.16
50020	Main Drive Gear Assem.	6	1.60	9.60
50041	Idler Gear Shaft	12	.16	1.92
50045	Idler Gear Assem.	12	.55	6.60
50070	Counter Oscillating Cam Assem.	6	2.04	12.24
50072	Thrust Bracket for Main Drive Shaft	12	.11	1.32

FRIDEN PARTS PRICE LIST (Continued)

PART NO.	PART NAME	AMT.	UNIT PRICE	EXT.
50590	Add-Subtract Gear Shaft Assem. Short	12	.52	6.24
50593	Add-Subtract Gear	24	.48	11.52
50595	Add-Subtract Gear Shaft Assem. Long	12	.54	6.48
50610	Transfer Gear Assem. - Long	12	.22	2.64
50615	Transfer Gear Assem. - Short	12	.22	2.64
50625	Centralizer Assem. - Add-Subtract Gate	3	1.00	3.00
50632	Pin for Cycle Lock	6	.40	2.40
50685	#12 Add-Subtract Gear & Shaft Assem.	6	1.40	8.40
51055	Main Drive Shaft Assem.	2	10.00	20.00
54565	Division Drive Gear Assem.	6	1.28	7.68
64575	Tabulator Shift Actuating Lever Assem.	12	.60	7.20
64610	Plus & Minus Gate Delatching Lever Assem.	12	.44	5.28
64665	Plus & Minus Gate Relatching Lever Link Assem.	12	.18	2.16
75139	Auto Clear Positioner Last Order	12	.05	.60
80505	Selecting Gear Shaft Assem. - Long	12	.36	4.32
80510	Selecting Gear Shaft Assem. - Short	12	.36	4.32
90006	Division Stop On Carriage	12	.07	.84
90043	1/8 Ball for Counter Detent	6 doz.	.06	.36
90050	Zero Stop Slide - Accumulator 8 Bank	6	.77	4.62
90055	Zero Stop Slide Assem. - Counter - 8 & 10 Bank	6	.27	1.62
90553	Zero Stop Lever	12	.10	1.20
91095	Transfer Lever Assem.	24	.18	4.32
91450	Counter Dial Shaft Assem. - Odd	12	1.40	16.80
91460	Counter Dial Shaft Assem. - Even	12	1.40	16.80
91550	Accumulator Dial Shaft Assem. - Odd	12	1.40	16.80
91553	Twirler Knob	24	.11	2.64
91560	Accumulator Dial Shaft Assem. - Even	12	1.40	16.80
91561	Accumulator Dial	24	.20	4.80